Model 108 Multicoupler / Antenna Coupler CU-1099/FRR

The TRAK Model 108 Multicoupler is the commercial equivalent of the Antenna Coupler CU-1099/FRR. All references to the CU-1099/FRR in the technical manual apply equally to the Model 108 Multicoupler.

NAVSHIPS 94933

TECHNICAL MANUAL

for

ANTENNA COUPLER CU-1099/FRR

TRAK
MODEL 108

DEPARTMENT OF THE NAVY
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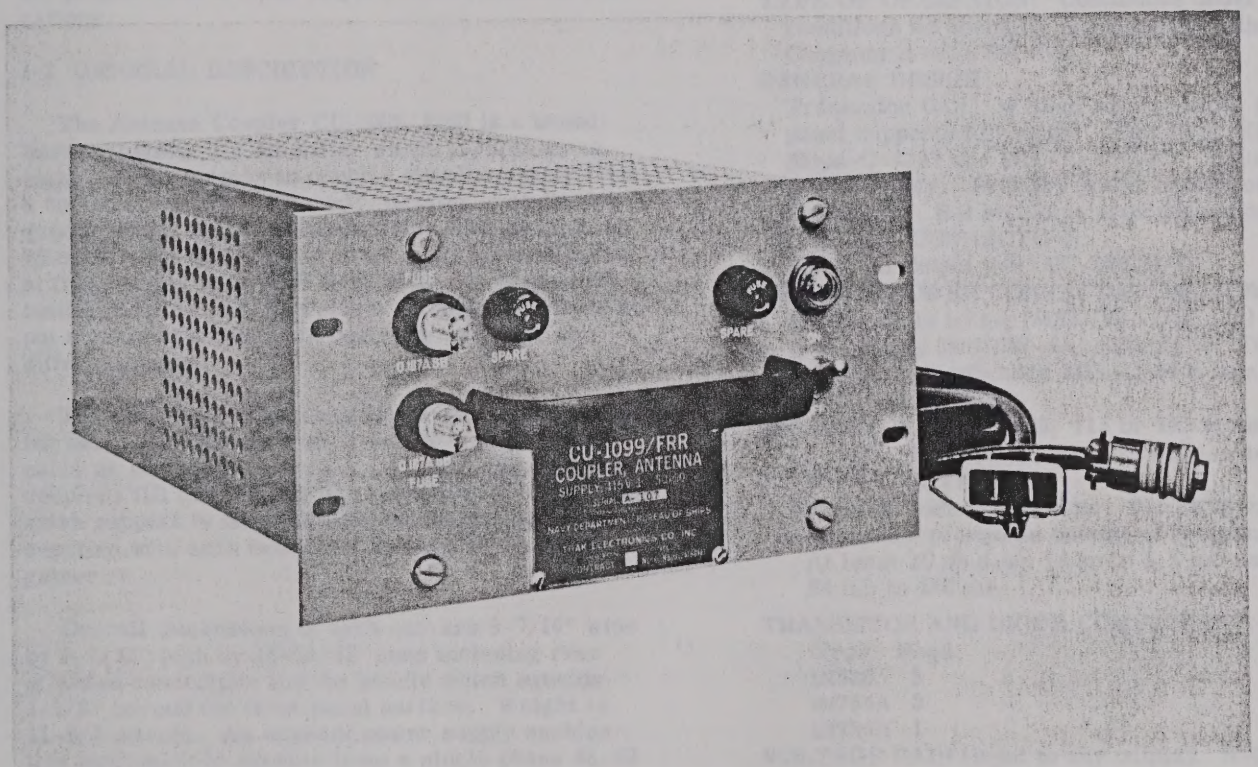


Figure 1-1. Antenna Coupler CU-1099/FRR

SECTION 1

GENERAL INFORMATION

1-1 SCOPE

This manual covers the description, installation, operation, and maintenance for Antenna Coupler CU-1099/FRR. Instructions for government-furnished materials (GFM) are not discussed in this manual. The manual is in effect upon receipt. Extracts from this publication may be made to facilitate the preparation of other Department of Defense publications.

1-2 GENERAL DESCRIPTION

The Antenna Coupler CU-1099/FRR is a broadband transistor r-f amplifier which permits up to eight 70-ohm outputs to operate simultaneously from a common antenna. The unit operates over the frequency range of 2 to 32 megacycles with an input of 70 ohms. An internal r-f filter suppresses signals at frequencies outside of this range. It is used in installations requiring a single antenna to provide input signals to a group of receivers operating on different bands.

The CU-1099/FRR comprises a single rack mounting panel and chassis with a dust cover and power cable as shown in figure 1-1. Placed side by side, two couplers fill the opening in a standard 19" rack. No extra support is necessary if the adapter plate, supplied with each two units, is used to tie them together.

Overall dimensions of each unit are 9-7/16" wide by 5-7/32" high by 16-11/32" deep including rear mounted connectors and the handle which extends 1-1/2" beyond the front panel surface. Weight is 11-1/2 pounds. An internal power supply enables this equipment to operate from a single phase 48-62 cps source of 105, 115, or 125 volts (±6%).

The power ON-OFF switch, POWER-ON indicator and two .187 amp slow-blow fuses with type FHL-17G blown-fuse indicators are located on the front panel in addition to a pair of fuse SPARES. The power ON-OFF switch is the only control used in operation of the equipment.

The power input connector, antenna input connector and eight BNC r-f output connectors are located at the rear of the unit. Impedance at the antenna input and each of the outputs is 70 ohms.

1-3 REFERENCE DATA

FREQUENCY RANGE: 2 to 32 mc
NUMBER OF OUTPUTS: 8
INPUT AND OUTPUT IMPEDANCE: 70 ohm unbalanced coaxial lines.
BANDPASS INPUT FILTER:
Attenuation, r-f:
40 db min between 14 kc and 150 mc
OVERALL DIMENSIONS:
9-7/16w by 5-7/32 h by 16-11/32 d
WEIGHT: 11-1/2 pounds
TYPE OF OPERATION: Continuous under adverse conditions as normally encountered in the Naval Communications Service.
GENERAL DESIGN:
Transistor Unit: Welded construction, front panel supports full weight. Complies with Ships-C-4297 and MIL-E-16400E. Includes dc power supply. Primary power conductors have r-f filters. R-f shielding provided throughout.
EXTERNAL CONNECTORS:
Input and Output r-f: UG-625-B/U
PRIMARY POWER CONNECTOR: MS-3102A-10SL-3P
Mating cable fitting (MS3106A-10SL-35) with cable clamp (MS3057-4A) suitable for TC0P4 cable per specification MIL-C-915; remote end has UP-121-M plug.
PRIMARY POWER: 105, 115 or 125 volts ±6%, 15 watts, 48 to 62 cycles single phase ac.
RF INPUT FILTER:
Insertion Loss: 2 - 32 mc 0.5 db max
Attenuation of signals outside of frequency range:
At least 30 db down 14 kc to 1.5 mc and from 54 mc to 150 mc.

TRANSISTOR AND DIODE COMPLIMENT:

Type	Reqd.
1N538	5
1N754A	2
1N755A	1

VOLTAGE GAIN (Input to any output): Within the limits of +1 to +2 db at all frequencies in range. Variations with line voltage change up to 10% from nominal value, do not exceed 1 db. Unused outputs may be short or open circuited.
VOLTAGE GAIN (Uniformity among couplers):
Same within 0.5 db at any frequency from 2 to 32 mc when comparing any outputs of any two multicouplers fabricated on the same contract or purchase order.
NOISE FIGURE: 10 db max
INPUT AND OUTPUT VSWR: 2:1 max
CROSSTALK ISOLATION: Greater than 40 db between outputs.
RADIATION (Back signal rejection): Greater than 50 db from any output connector to input.
INTERMODULATION (Spurious responses):
Second Order Products: 60 db down
Third Order Products: 60 db down

OVERLOAD CAPABILITIES: Less than 3 db reduction of gain to any 100 μv signal in the 2-32 band by a 1.5 volt signal of any other frequency.

PHASE CHARACTERISTICS:

Phase difference between any two outputs on same unit: Plus or minus two degrees max.

Phase difference between any two outputs on any two units: Plus or minus two degrees max.

Spurious response from two 0.25 volt signals f_1 and f_2 applied to the antenna input at any of the frequencies in the 2-32 megacycle range does not exceed the following limitations: the response of $f_1 \pm f_2$ and $2f_1 \pm f_2$ is no greater than an equivalent signal of 250 microvolts.

1-4 FACTORY OR FIELD CHANGES

No factory or field changes have been made on the CU-1099/FRR.

1-5 EQUIPMENT SIMILARITIES

All units fabricated under the same contract or purchase order are mechanically and electrically identical. Modular design of the Antenna Coupler CU-1099/FRR facilitates its removal for replacement or maintenance purposes.

TABLE 1-1. EQUIPMENT SUPPLIED

QTY PER EQUIP	NOMENCLATURE		OVER-ALL DIMENSIONS (IN.)			VOLUME (CU FT)	WEIGHT (LB)
	NAME	DESIGNATION	HEIGHT	WIDTH	DEPTH		
1	Antenna Coupler	CU-1099/FRR	5-7/32	9-7/16	16-11/32	.468	11.5
*	Adapter Plate		5	2	3/32		
**	Technical Manual	NAVSHIPS 94933	11	8-1/2	1/2		

* One adapter plate supplied with each two units.

** Manuals supplied in bulk quantity only.

TABLE 1-2. EQUIPMENT AND PUBLICATIONS REQUIRED BUT NOT SUPPLIED

QTY PER EQUIP	NOMENCLATURE		REQUIRED USE	ANTENNA COUPLER CU-1099/FRR EQUIPMENT CHARACTERISTICS
	NAME	DESIGNATION		
1	Multimeter with Instruction Book	AN/PSM-4C or Simpson Model 260	Voltage Measurements	Voltages: 27vdc, 125vac Frequency: 60 cps
1	Oscilloscope with Instruction Book	Hewlett Packard Model 130A	Alignment	
1	Signal Generator with Instruction Book	Hewlett Packard Model 606A	Gain Adjust and Alignment	1.5mc to 50mc
1	RF Attenuator with Instruction Book	Daven Co. Model 650-70	Gain Adjust and Input Filter Alignment	70 ohms
1	RF Attenuator with Instruction Book	Daven Co. Model 561	Alignment	
2	Impedance Transformer, 50 ohms (female BNC) to 70 ohms (male BNC)	Applied Research Corp.	Gain Adjust and Alignment	
1	Low Pass Filter, cut off 30db at 3mc	Trak Electronics Co. Part No. A8657	Input Filter Alignment	

TABLE 1-2. EQUIPMENT AND PUBLICATIONS REQUIRED BUT NOT SUPPLIED (cont)

QTY PER EQUIP	NOMENCLATURE		REQUIRED USE	ANTENNA COUPLER CU-1099/ FRR EQUIPMENT CHARACTERISTICS
	NAME	DESIGNATION		
1	RF Voltmeter with Instruction Book	Boonton Model 91-C	Input Filter Alignment and Gain Adjust	
1	Hybrid	Trak Electronics Co, Part No. A8656	Alignment	
1	Detector	Trak Electronics Co. Part No. A8655	Alignment	
1	Transistor Test Set	TS-1100A/U	Test Transistors	

SECTION 2

INSTALLATION

2-1 POWER REQUIREMENTS

The CU-1099/FRR is designed to operate from a power source of 105, 115, or 125v (±6%), 48 to 62 cycle, single phase alternating current. The power transformer (T1) is wired for 115v operation when it is shipped from the factory. Terminal 1 of the power transformer is common to all voltage inputs. Connection of the red lead varies with the input voltage as indicated in table 2-1.

TABLE 2-1 POWER TRANSFORMER WIRING

LINE VOLTAGE	FREQUENCY (CYCLES)	INPUT TERMINAL (RED LEAD ON T1)
105V	48 to 62	2
115V	48 to 62	3
125V	48 to 62	4

2-2 INSTALLATION

a. Mounting. - The front panel of the CU-1099/FRR is designed to support the full weight of the unit. One adapter plate is supplied with each two units. Tied together with the adapter plate as shown in figure 2-1, two units provide an assembly which can be mounted in a standard 19" rack Slots in the front panel allow for mounting tolerance variation.

b. Power Input. - (See figure 2-1) Before attempting to energize the CU-1099/FRR, check the power source and the wiring of T1 against table 2-1. Power input connector J501 is located at the lower right of the rear panel. A 6-foot power cable is supplied with each coupler.

c. Signal Input - Connect a 70-ohm coaxial cable between J503 (located directly above the power input) and the antenna.

d. Signal Output. - Connect each receiver or other output device through a 70-ohm coaxial cable to one of the eight (BNC type UG-625-B/U) output connectors on the rear of the coupler Unused output connectors need not be terminated.

2-3 ENERGIZING THE WQUIPMENT

Operation of the power ON/OFF switch on the front panel is the only action required to energize the equipment

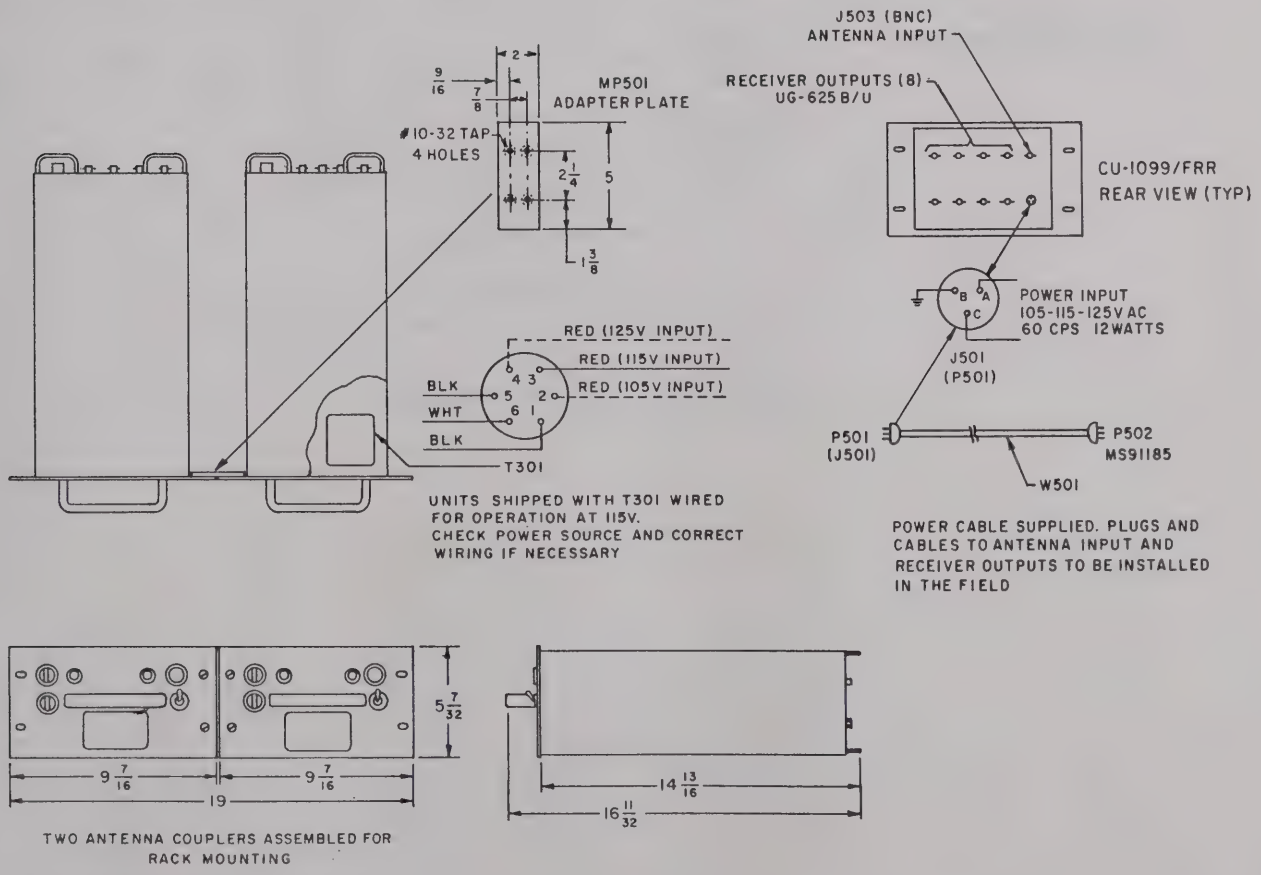


Figure 2-1. Installation Drawing, Antenna Coupler CU-1099/FRR

SECTION 3

OPERATION

3-1 OPERATING PROCEDURE

To energize the Antenna Coupler CU-1099/FRR turn the front panel power switch to ON (see figure 3-1). There are no other controls. When this switch is on the POWER indicator will glow.

A lighted fuse indicator identifies a blown fuse. To replace, turn the lighted indicator counterclockwise, thus opening the holder requiring a new fuse. Two spare fuses are located in the SPARE fuse holders in the center of the front panel.

3-2 OPERATIONAL CHECK

A sample check for CU-1099/FRR operation can be made by following the procedure outlined below.

a. Place power switch in ON position.

b. Compare the output of a receiver at several frequencies in the 2 to 32 mc band when it is connected to the multicoupler as outlined above, with the output when it is connected directly to the antenna. There should be no perceptible difference.

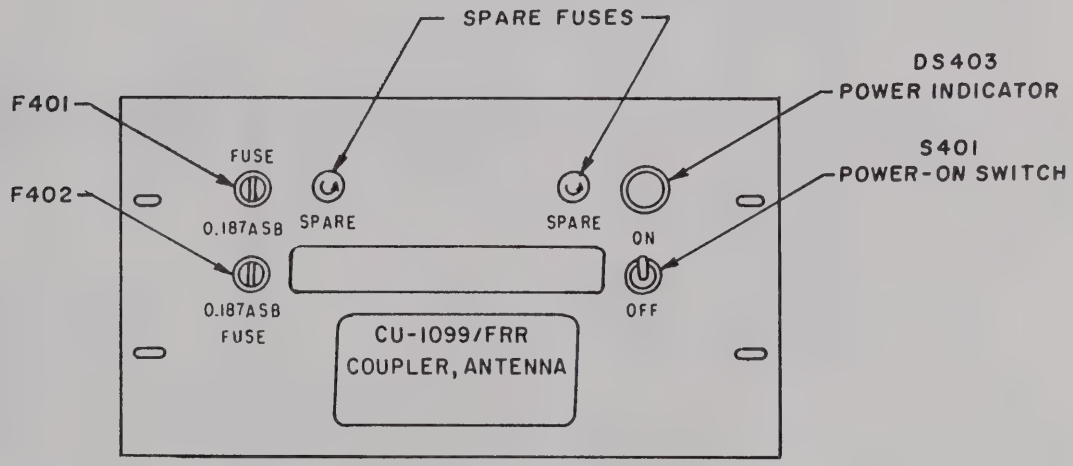


Figure 3-1. Front Panel, CU-1099/FRR

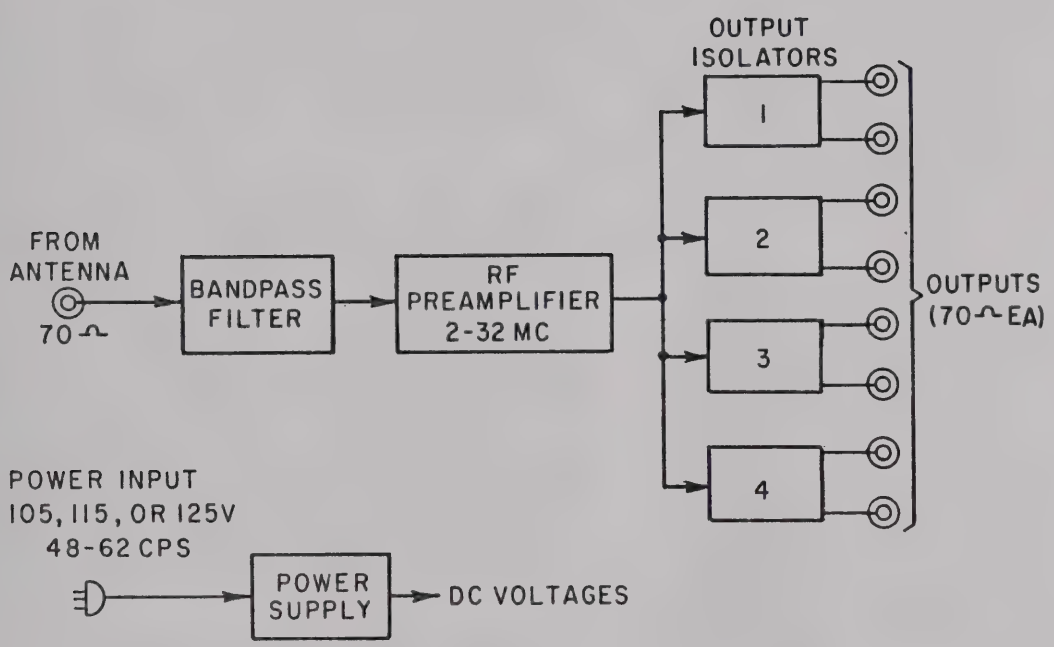


Figure 4-1. Overall Block Diagram, CU-1099/FRR

SECTION 4

TROUBLE SHOOTING

4-1 LOGICAL TROUBLE SHOOTING

a. SYMPTOM RECOGNITION. - This is the first step in the trouble-shooting procedure and is based on a complete knowledge and understanding of equipment operating characteristics. All equipment troubles are not the direct result of component failure. Therefore, a trouble in an equipment is not always easy to recognize since all conditions of less than peak performance are not always apparent. This type of equipment trouble is usually discovered while accomplishing preventive maintenance procedures, such as the POMSEE checks. It is important that the "not so apparent" troubles, as well as the apparent troubles, be recognized.

b. SYMPTOM ELABORATION. - After an equipment trouble has been "recognized", all the available aids designed into the equipment should be used to further elaborate on the original trouble symptom.

c. LISTING PROBABLE FAULTY FUNCTION. - The next step in logical trouble shooting is to formulate a number of "logical choices" as to the cause and likely location (functional section) of the trouble. The "logical choices" are mental decisions which are based on knowledge of the equipment operation, a full identification of the trouble symptom, and information contained in this manual. The overall functional description and its associated block diagram should be referred to when selecting possible faulty functional sections.

d. LOCALIZING THE FAULTY FUNCTION. - For the greatest efficiency in localizing trouble, the functional sections which have been selected by the "logical choice" method should be tested in an order that will require the least time. This requires a mental selection to determine which section to test first. The selection should be based on the validity of the "logical choice" and the difficulties in making the necessary tests. If the tests do not prove that functional section to be at fault, the next selection should be tested, and so on until the faulty functional section is located. As aids in this process the manual contains a functional description and a servicing block diagram for each functional section. Waveforms (or other pertinent indications) are included at significant check points on servicing block diagrams to aid in isolating the faulty section. Also, test data (such as information on control settings, critical adjustments, and required test equipment) are supplied to augment the functional description and servicing block diagram for each functional section.

e. LOCALIZING TROUBLE TO THE CIRCUIT. - After the faulty functional section has been isolated, it is often necessary to make additional "logical choices" as to which group of circuits or circuit (within the functional section) is at fault. Servicing block diagrams for each functional section and individual functional circuit groups (when required) provide the signal flow and test location information needed to bracket and then isolate the faulty circuit. Functional descriptions, simplified schematics, and pertinent test data for individual circuits or groups of circuits comprising the functional section are all placed together in one area of the manual. Insofar as is practicable, this information is contained on facing pages. Information which is too lengthy in nature to be included in this arrangement is readily referenced from the test data portion of the trouble-shooting information.

f. FAILURE ANALYSIS. - After the trouble (faulty component, misalignment, etc.) has been located (but prior to performing corrective action), the procedures followed up to this point should be reviewed to determine exactly why the fault affected the equipment in the manner it did. This review is usually necessary to make certain that the fault discovered is actually the cause of the malfunction, and not just the result of the malfunction.

4-2 OVERALL FUNCTIONAL DESCRIPTION

Figure 4-1 is a block diagram of the complete multicoupler. Input signals from the antenna are passed to the preamplifier through the bandpass filter, which presents an input and output impedance of 70 ohms. The filter has an insertion loss of less than 1/2 db over the 2-32 mc frequency range, and attenuates signals at all other frequencies. From 14 kc to 1.5 mc and 54 mc to 15- mc, the filter presents at least 30 db attenuation.

The preamplifier drives four identical output isolators each containing two identical output circuits. Each output circuit isolates the associated load circuit (receiver) from all other outputs.

4-3 BANDPASS FILTER

As shown in the schematic figure 5-10, the first half of this filter is a high pass section followed by a low pass section. C201 and C205 are adjusted to give maximum attenuation at 50 mc and L205 and L207 are adjusted to give maximum attenuation at 1.4 mc. Details for proper adjustment of these components are covered in paragraph 5-2. C203, C209, and C211 are used to compensate for phase. Details on proper adjustment of these for phase is covered in paragraph

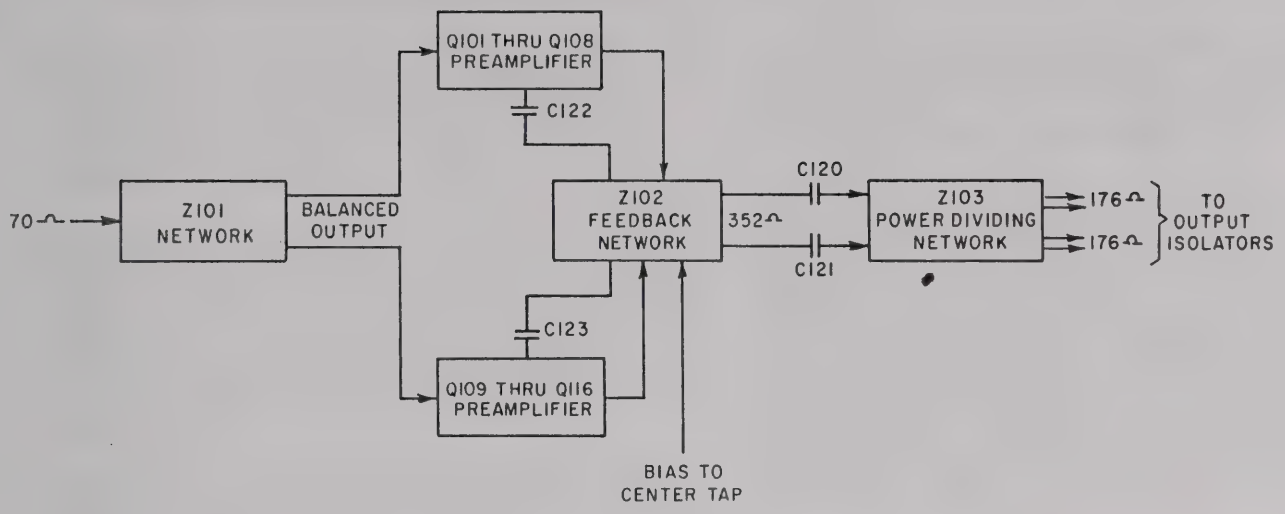


Figure 4-2 Block Diagram, Preamplifier

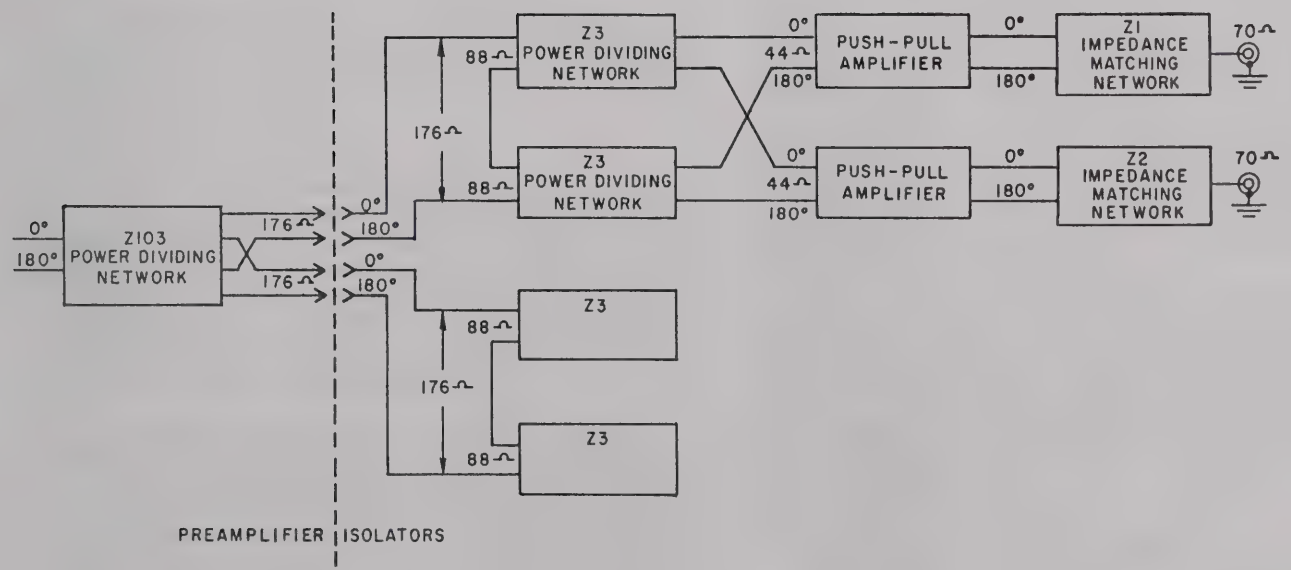


Figure 4-3. Block Diagram, Isolators

5-3. When properly terminated with 70 ohms the filter presents less than 1/2 db insertion loss in the range of 2 to 32 megacycles.

4-4 RF PREAMPLIFIER FUNCTIONAL DESCRIPTION

As shown in figure 4-2 and schematic figure 5-10 the r-f preamplifier consists of a single class A push pull parallel stage. Using low-noise, high-frequency transistors, this configuration makes possible wide-band operation with a low-noise figure, low circuit impedances and relatively low gain.

The network Z101 converts the single ended output of the filter FL201 to balanced signals. These are used to drive the emitters of two sets of paralleled amplifiers (Q101 thru Q108 and Q109 thru Q116) in push-pull. One winding of the network serves as a dc return and r-f choke for Q109 thru Q116. The other winding is by-passed to ground for dc by the r-f choke L101 thus providing a dc return for Q101 through Q108.

Outputs of this stage are taken from the collectors of the transistors and applied to the feedback network Z102 and to the power dividing network Z103. Coupling capacitors C122 and C123 provide feedback from the taps on the feedback network to the bases of the transistors. Capacitors C120 and C121 are used for coupling between the collectors and power dividing network Z103 to permit it to work at dc ground. The impedance at the input of Z103 is approximately 352 ohms. The two push-pull outputs of Z103 have Class A amplification, 176 ohms impedance and are used to drive the isolators.

Push-pull design is used throughout the multicoupler to minimize spurious effects from strong signals by cancelling even-order harmonics and intermodulation distortion products.

4-5 OUTPUT ISOLATORS

The four output isolators provide signal inputs to the (one to eight) receivers used in conjunction with each CU-1099/FRR. Almost all receivers provide an input impedance of 70 ohms only at the frequencies to which they are tuned, leaving the others either short or open circuited. Since all of the receivers may be tuned to different frequencies, inadequate isolation will degrade the incoming signals.

The purpose of the output isolator is to provide at least 40 db isolation between receiver circuits regardless of the frequency to which they are tuned. Figure 4-3, the block diagram of the isolators, shows how the power dividing network (Z103) in the preamplifier feeds the isolators. The output of Z103 consists of two sets of signals which are 180° out of phase with one another. Impedance between the out-of-phase sets is 176 ohms.

Two isolators are connected in series with each set of outputs from Z103, thereby supplying the required 88-ohm input to the isolators. Each isolator contains a power dividing network (Z3) similar to Z103, but with half the impedance. This 44-ohm impedance matches the input impedance of the four transistor push-pull amplifier to which it is connected.

The output of the push-pull amplifier is fed to L1 or L2 at 630 ohms impedance where it is dropped to an unbalanced 70 ohms at the output. Inductance in the output lead of L3 or L4 is used to adjust the phase of the isolator output. (See Section 5)

Isolation between the circuits is accomplished as follows. A signal voltage applied at the output connector appears across the primary of the output network Z2 and therefore across the 430-ohm terminating resistors and the collectors of the push-pull transistors. Since the transistor collector impedance is large compared to the impedance of the terminating resistors, nearly all the signal current flows through the terminating resistors. The remaining small portion of the signal current is coupled to the emitters due to the collector-to-emitter capacitance of the transistors. It is this small portion that couples to the other circuits.

4-6 POWER SUPPLY

The power supply operates from an input source of 105 - 115 - 125 volts ±6%, 48 to 62 cycle, single phase alternating current. This is fed to a power transformer T301 which has primary taps to accommodate a 105, 115 or 125 volt input. All required dc outputs are derived from use of a full wave silicon rectifier bridge, CR303 thru CR306, and its output voltage dividing and dropping resistors. The output at C302 is approximately -27 volts and 400 milliamperes. This output is regulated to -19 volts by the transistors Q301 and Q302 and the diodes CR301, CR302 and CR307. R308 is adjusted to set the output voltage to exactly -19 volts. R302 and R307 form a bleeder to provide -5 volts bias to the bases of the transistors in the preamplifier. R301 and CR308 form a bleeder which provides 7.5v bias for the bases of the transistors in the isolators. This voltage is regulated by zener diode CR308.

FL401 is an r-f filter placed in the input ac line to prevent unwanted r-f from entering or leaving the power supply through the primary power circuit. In combination with the power supply this filter attenuates any r-f energy from 14 kc to 150 mc by at least 40 db. This figure includes the total attenuation between either side of the primary ac line and any dc output of the power supply.

4-7 ADJUSTMENT AND ALIGNMENTS

Table 4-1 is a list of alignments and adjustments which would cause faulty operation if improperly adjusted.

4-8 ISOLATION OF TROUBLE

Use of gain checks as described in paragraph 5-1 should help isolate trouble. If an overall gain

measurement is made and all outputs shown gain low, look for trouble in the preamplifier. If overall gain is satisfactory with the filter removed and poor with the filter in the circuit, the filter is probably at fault.

Measurement of the dc voltages at the transistors can indicate a defective transistor. If one of the parallel transistors is open it will be evident by insufficient dc voltage at the emitter. With an r-f signal going through the multicoupler, r-f voltage would be more decernable at the emitter of the open transistor when using an r-f probe connected to an r-f voltmeter.

When a transistor is shorted the voltage at the base is higher than normal for that side of the amplifier.

TABLE 4-1. TROUBLE SHOOTING CHART

MALFUNCTION	CIRCUIT AFFECTED	CORRECTIVE ADJUSTMENT	ALIGNMENT (Paragraph)
Attenuation Above 50 mc	Band-pass Filter FL201	C201, C203	5-2
Attenuation Below 1.5 mc	Band-pass Filter FL201	L205, L207	5-2
Phase Shift unit to unit	Band-pass Filter FL201	C203, C209, C211	5-2
Phase at J1 and J2	Isolator Boards	L3, L4	5-3

SECTION 5

MAINTENANCE

TABLE 5-1. RECOMMENDED TEST EQUIPMENT, GAIN ADJUST

QTY	EQUIPMENT	MANUFACTURER
1	Signal Generator	Hewlett Packard Model 606A
1	RF Attenuator	Daven Co. Model 650-70
1	RF Vacuum Tube Voltmeter	Boonton Model 91-C
1	Impedance Transformer, 50 to 70 ohms	Applied Research

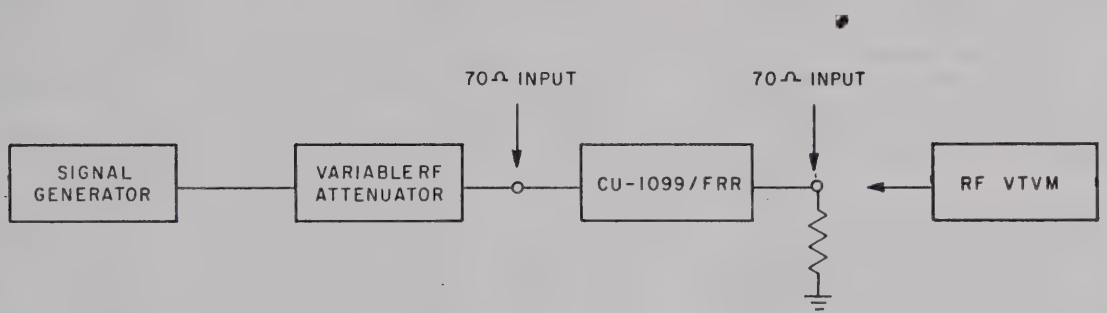


Figure 5-1. Gain Test Setup

TABLE 5-2. RECOMMENDED TEST EQUIPMENT, INPUT FILTER ALIGNMENT

QTY	EQUIPMENT	MANUFACTURER
1	Signal Generator	Hewlett Packard Model 606A
1	RF Attenuator	Daven Co. Model 650-70
2	Impedance Transformer 50 to 70 ohms	Applied Research
1	Low Pass Filter, cut off at 3 db	Trak Electronics Co. Part A8657
1	RF Vacuum Tube Voltmeter	Boonton Model 91-C

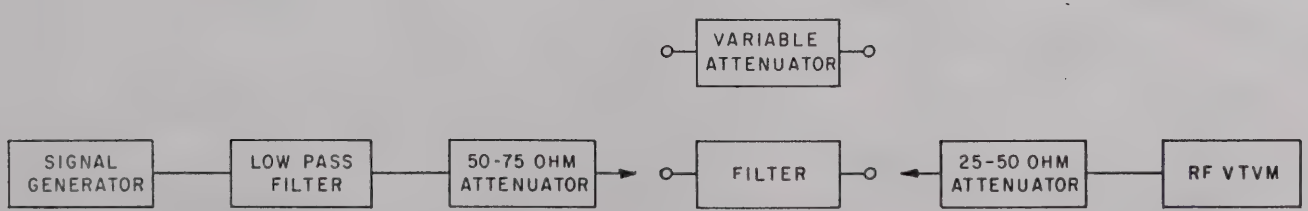


Figure 5-2. Test Setup, Alignment of Input Filter

SECTION 5

MAINTENANCE

5-1 GENERAL REQUIREMENTS

For maintenance purposes, the Antenna Coupler CU-1099/FRR can be considered to be in satisfactory operating condition if the equipment will pass two basic tests. these are a) gain, and b) voltage checks. The methods of performing these tests are outlined below. If the equipment fails to deliver satisfactory test results, an attempt should be made to isolate and test the particular circuit containing the fault.

a. GAIN TEST. The gain of this equipment is defined as the available power gain, G=P2/P1 where:

P1 is the power a signal generator, set for a particular frequency and output level will deliver into a resistor R_o, and

P2 is the power the multicoupler will deliver into a 70 ohm resistor connected to one of its outputs when driven by the same generator, at the same settings, connected to the input terminals having the impedance R_o.

The equipment setup diagrammed in figure 5-1 can be used to make the gain measurement directly and without calculations.

Recommended test equipment is listed in Table 5-1. The procedure is as follows:

1. Set the attenuator for a minimum of 10 db. Leaving the antenna multicoupler out of the circuit, connect the signal generator, through the attenuator, directly to the 70 ohm termination and r-f vacuum-tube voltmeter.
2. Set the generator output level for a convenient reading on the vtvm. Then insert the multicoupler in the circuit as shown, and introduce enough attenuation in the antennuator box to return the vtvm to its original reading. The amount of additional attenuation introduced is equal to the gain and should be approximately 1 to 2 db. This test should be repeated for all 8 output jacks at five or six frequencies through the 2-32 mc range.

If continuous observation over a range of frequency is desired, a sweep signal generator may be substituted for the variable signal generator and an oscilloscope with detector probe may be substituted for the vtvm in the above procedure.

b. VOLTAGE CHECKS. Table 5-3 lists voltages to be expected at major points in the equipment under normal operation. It is recommended that these points be checked for proper readings as a part of the regular maintenance procedure for the equipment.

The distortion and noise characteristics of the equipment cannot be checked without extensive testing beyond the normal scope of maintenance procedures. If all circuits perform properly as indicated by a check of the voltage readings and the gain tests described above, there is also assurance that the distortion and noise specifications are being maintained.

5-2 INPUT FILTER ALIGNMENT

a. RECOMMENDED TEST EQUIPMENT. Table 5-2 lists test equipment required for servicing the input filter.

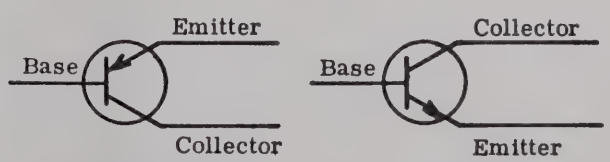
Note

There is interaction between the adjustments and several minimums can be found. Adjustment should be to the one giving the lowest output on the vtvm.

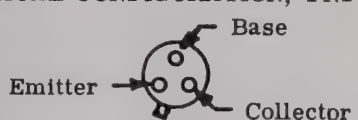
TABLE 5-3. VOLTAGE CHART

LOCATION	COMPONENT	VOLTAGE (to ground)
Power Supply	C302	-27
	J302A	-6.8
	J302B	-5
	J302D	-19
Preamplifier	All Emitters	-4 6
	All Bases	-4.8
	All Collectors	-19
Output Isolators	All Emitters	-6.6
	All Bases	-6.8
	All Collectors	-19

TRANSISTOR ELEMENT IDENTIFICATION



MECHANICAL CONFIGURATION, PNP AND NPN



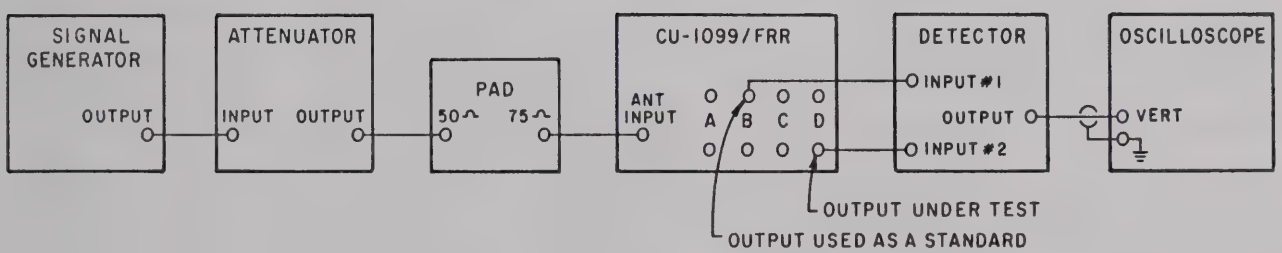


Figure 5-3. Test Set-up, Alignment of Isolator

b. ALIGNMENT. Set up the equipment as shown in figure 5-2. Set the signal generator to 1.4 mc and adjust L205 and L207 for a minimum response on the r-f vtvm. After obtaining a minimum on the vtvm substitute the attenuator for the filter. Adjust the attenuator to give the same reading on the vtvm as obtained after the filter was adjusted. Attenuator should be set for at least 40 db. Repeat the above, supplying a 50 mc signal and adjusting C201 and C203 for a minimum. Forty db attenuation is required for this adjustment also to check the band pass input signals in the range of 2 to 32 mc. The meter reading should not be more than 1/2 db lower than that obtained with the filter removed and substituted with an attenuator set at 0 db attenuation.

Note

Adjustment of C203, C209 or C211 has little effect on the filtering characteristics and are used to adjust the overall multicoupler for a phase match to other units (see paragraph 5-3).

5-3 ALIGNMENT OF THE CU-1099/FRR

Maximum performance from the CU-1099/FRR depends upon proper alignment of the equipment. Table 5-4 lists the test equipment required for alignment. Tolerance variation among components makes it necessary to align each output on the coupler. Phase shift of the eight outputs must be within 2^{o} of any output which is chosen as a standard. Each coupler is aligned at the factory using the top output (J3) of the isolator in position "B" as the standard. The slug of the inductor (L3) serving this output is adjusted to approximately 1/16" (about three turns) from the rear of the coil before proceeding to align the other outputs to it.

If it is necessary to replace an isolator in an otherwise functioning unit, J3 on the isolator in position "B" may be used as the standard. Should the isolator in position "B" need replacement, adjust the inductor (L3 or L4) serving the output chosen as a standard and align the other seven outputs to it.

a. ALIGNMENT OF AN ISOLATOR BOARD. Set up the equipment as shown in figure 5-3 and proceed as follows:

1. Set Signal Generator to 30 mc
2. Advance the signal generator output and adjust the scope controls to display the 400 cycle sine wave.
3. Adjust the BALANCE control on the detector for a null on the scope pattern.
4. Remove the cable between the detector and the isolator under test.

CAUTION

- The output voltage to the coupler should not exceed 1v rms.

5. Set the attenuator for 29 db and advance the output of the signal generator until a sine wave of convenient amplitude is displayed on the scope. This represents 2^{o} phase.
6. Remove the 29 db from the attenuator and replace the cable between the isolator under test and the detector.
7. Adjust the appropriate inductor (L3 or L4) until the amplitude on the scope is at a minimum (less than the 2^{o} reference).
8. Repeat steps 1 thru 6 for remaining output on isolator under test.

b. ALIGNMENT OF THE OVERALL UNIT. The overall unit will need realignment at 2 mc and at 30 mc if the input filter is replaced or if for any reason the adjustments on that assembly have been changed.

Using a coupler with proper phase shift as a standard, set up the equipment as shown in figure 5-4 and proceed as follows:

Note:

Be sure that matched 75-ohm cables are used between the detector and the coupler under test.

TABLE 5-4. RECOMMENDED TEST EQUIPMENT, ALIGNMENT

QTY	EQUIPMENT	MANUFACTURER
1	Signal Generator	Hewlett Packard Model 606A
1	RF Attenuator	Daven Co. Model 651
1	Impedance Transformer, 50 to 70 ohms, cut off at 3 db	Applied Research
1	Oscilloscope	Hewlett Packard Model 130A
1	Hybrid	Trak Electronics Co. Part A8656
1	Detector	Trak Electronics Co. Part A8655

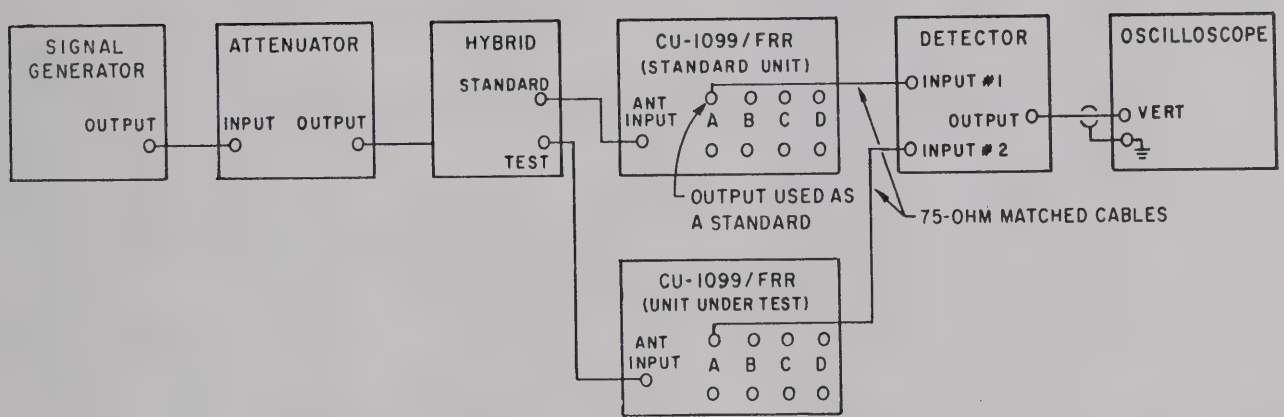


Figure 5-4. Test Set-up, Alignment of Overall Unit

1. Set the signal generator to 2 mc, 400 cycles, and 100% modulation.
2. Advance the output of the signal generator and adjust the controls on the scope to display the 400 cycle sine wave.
3. Adjust the BALANCE control on the detector for a null on the scope pattern.
4. Remove the cable between the detector and the coupler under test.
5. Set the attenuator for 29 db and advance the output of the signal generator until a sine wave of convenient amplitude is displayed on the scope. This represents 2^{O} phase.
6. Remove the 29 db from the attenuator and replace the cable between the detector and the coupler under test.
7. Adjust C209 and C211 on the input filter of the coupler under test until the scope amplitude is at a minimum (less than the 2^{O} reference).
8. Set the signal generator to 30 mc, 400 cycles, and 100% modulation.
9. Repeat steps 2 thru 7.
10. Adjust C203 on the input filter of the coupler under test until the scope amplitude is at a minimum (less than the 2± reference).
11. Check all outputs on the coupler for 2^{O} phase shift (see par. 5-3a).

5-4 MECHANICAL DISASSEMBLY

a. OVERALL ASSEMBLY. Figure 5-5 shows a rear view of the CU-1099/FRR with all components in place and the dust cover removed. As shown in figure 5-6, all assemblies which comprise the unit can be removed.

b. DUST COVER. Two captive fasteners on the rear of the unit hold the dust cover in place. A one-half counter-clockwise turn will disengage the fastener and allow the cover to be drawn off from the rear.

c. ISOLATORS (see figure 5-5). Components on the isolator circuit board are identified in figure 5-7. All four of these assemblies are mechanically identical but each is electrically aligned for the position it occupies. Before shipping, the assemblies are marked A, B, C, and D for convenience in servicing the unit.

These assemblies plug directly into the connector board and are held in place by spring loaded slides. To remove an isolator, disengage the board from the connector by pushing to the rear from the inside top corner. Once the board is free it can be pulled from the rear by the top and bottom of the back plate.

d. PREAMPLIFIER - CONNECTOR BOARD ASSEMBLY. This assembly (see figure 5-5) stands upright across the unit directly in front of the isolators. It is held in position by spring loaded slides.

Before attempting to remove this assembly, be sure that the four isolators are unplugged and stand free of the connector board, and that the cables are disconnected. W101, the white coaxial cable from the left of the preamplifier board, terminates with the BNC plug P101 and mates with J201 on the bandpass filter. A one-quarter counter-clockwise turn unlocks the plug for removal. The heavier black cable (W102) terminates with P102 terminates with P102 and mates with J302 on the power supply. It is held in place by a double locking ring fastener which can be separated by a one-quarter turn in either direction allowing the plug to be pulled from the socket.

Components on the preamplifier are identified in figure 5-8. The connector board is shown in figure 5-9. The combined assembly can be drawn up from the top of the unit by putting the top spacers while bracing the fingers on the frame.

e. BAND-PASS FILTER. This assembly is mounted on the left side of the frame (see figure 5-5). It has two plugs for cable connectors. J201 connects to the preamplifier cable W101, and J203 connects to P403 on the antenna input cable W502.

f. POWER SUPPLY A301. All components which comprise the power supply are mounted on a plate directly behind the front panel (see figure 5-5). Four right angle brackets with welded nuts provide mounting for the plate. Components on the power supply circuit board A302 are silk screened on the board, other components are identified in figure 5-6.

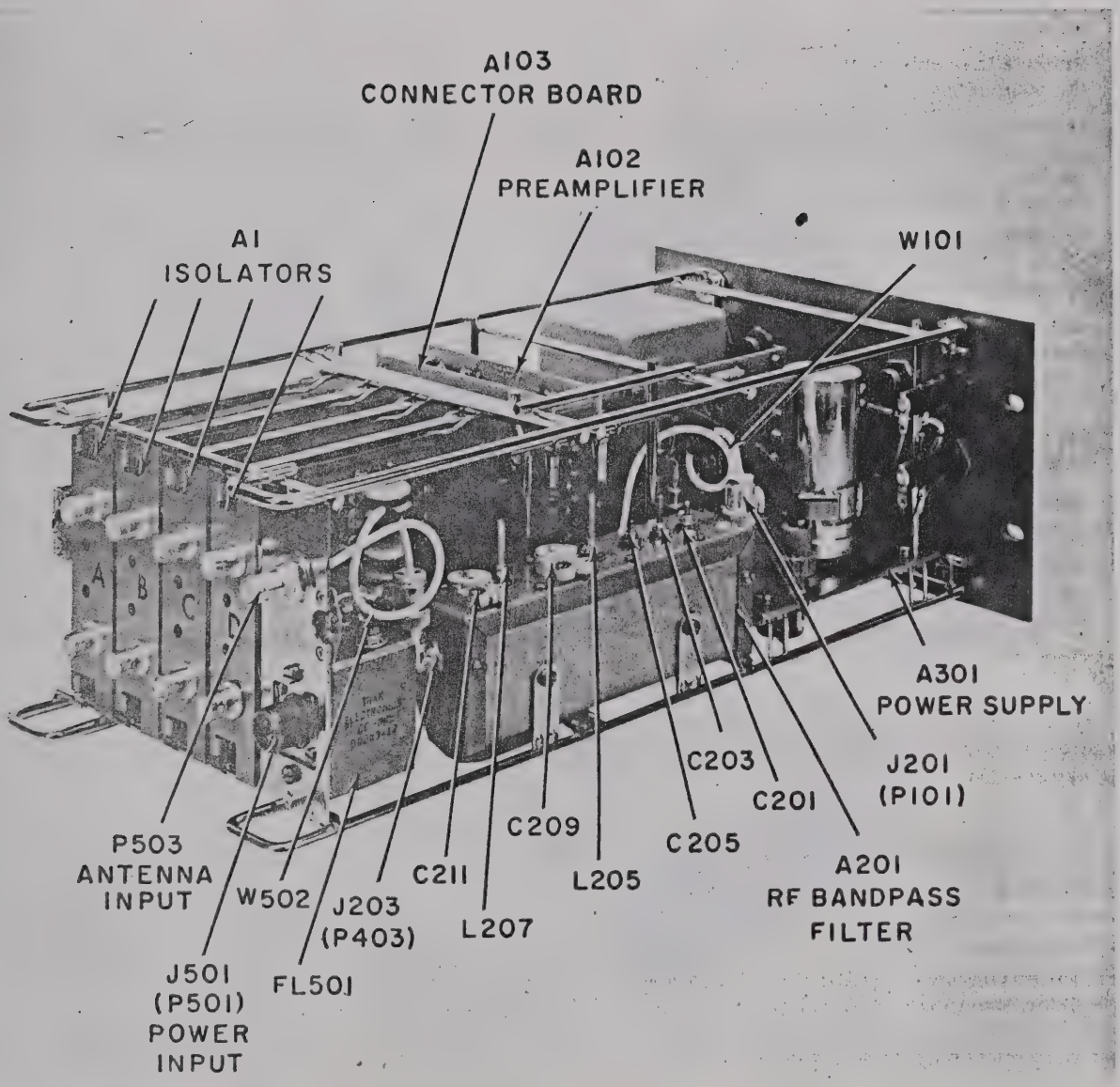


Figure 5-5. Rear View, Dust Cover Removed

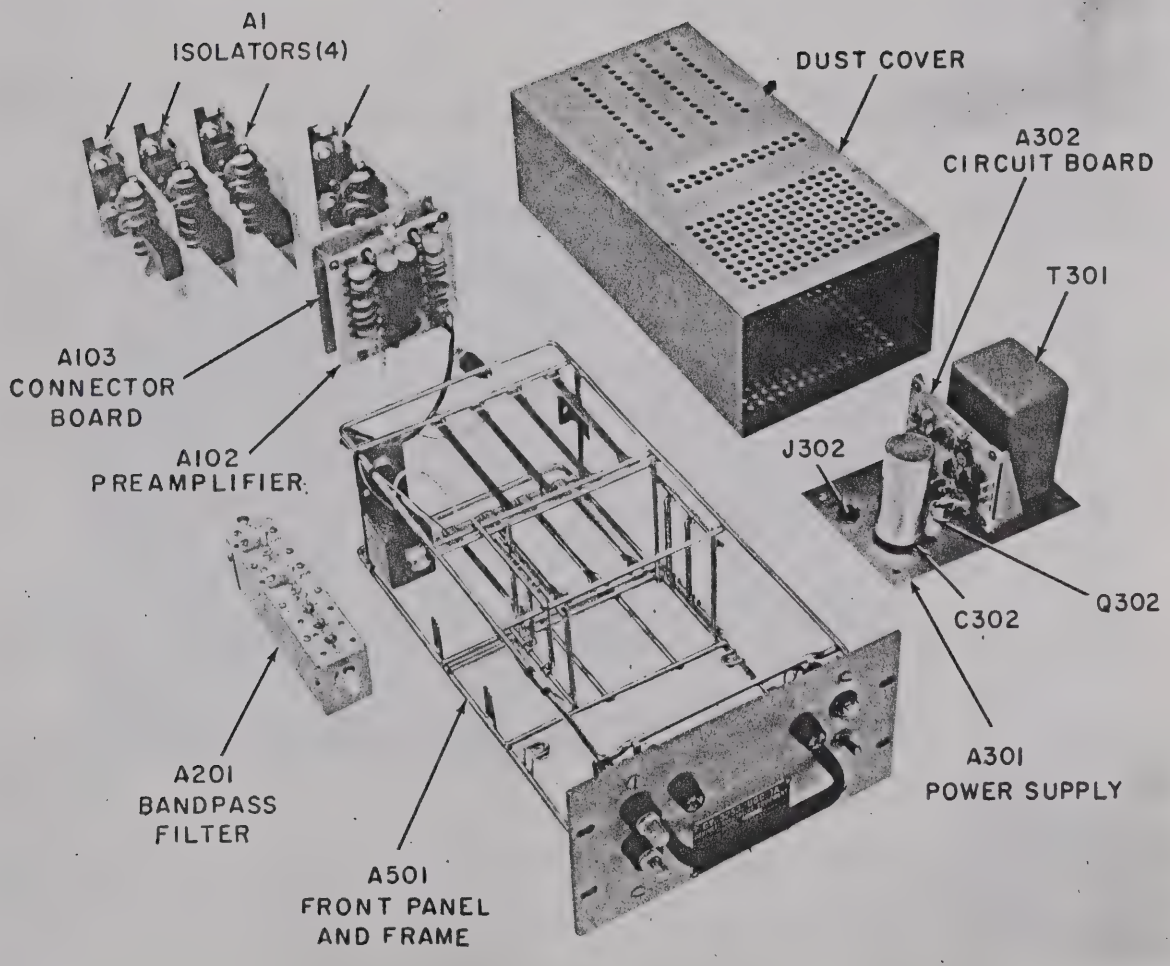


Figure 5-6. CU-1099/FRR, Disassembled

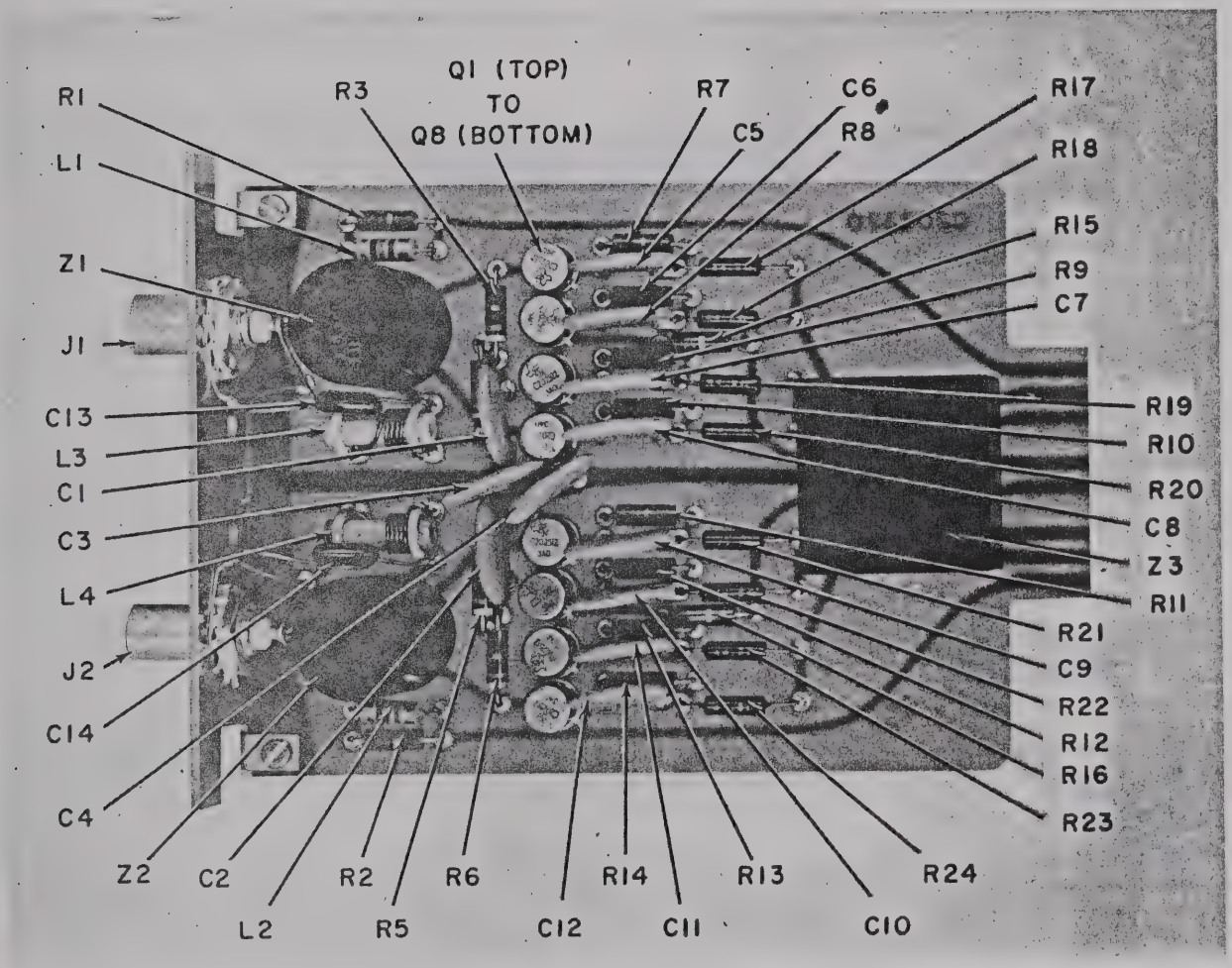


Figure 5-7. Isolator Assembly A1

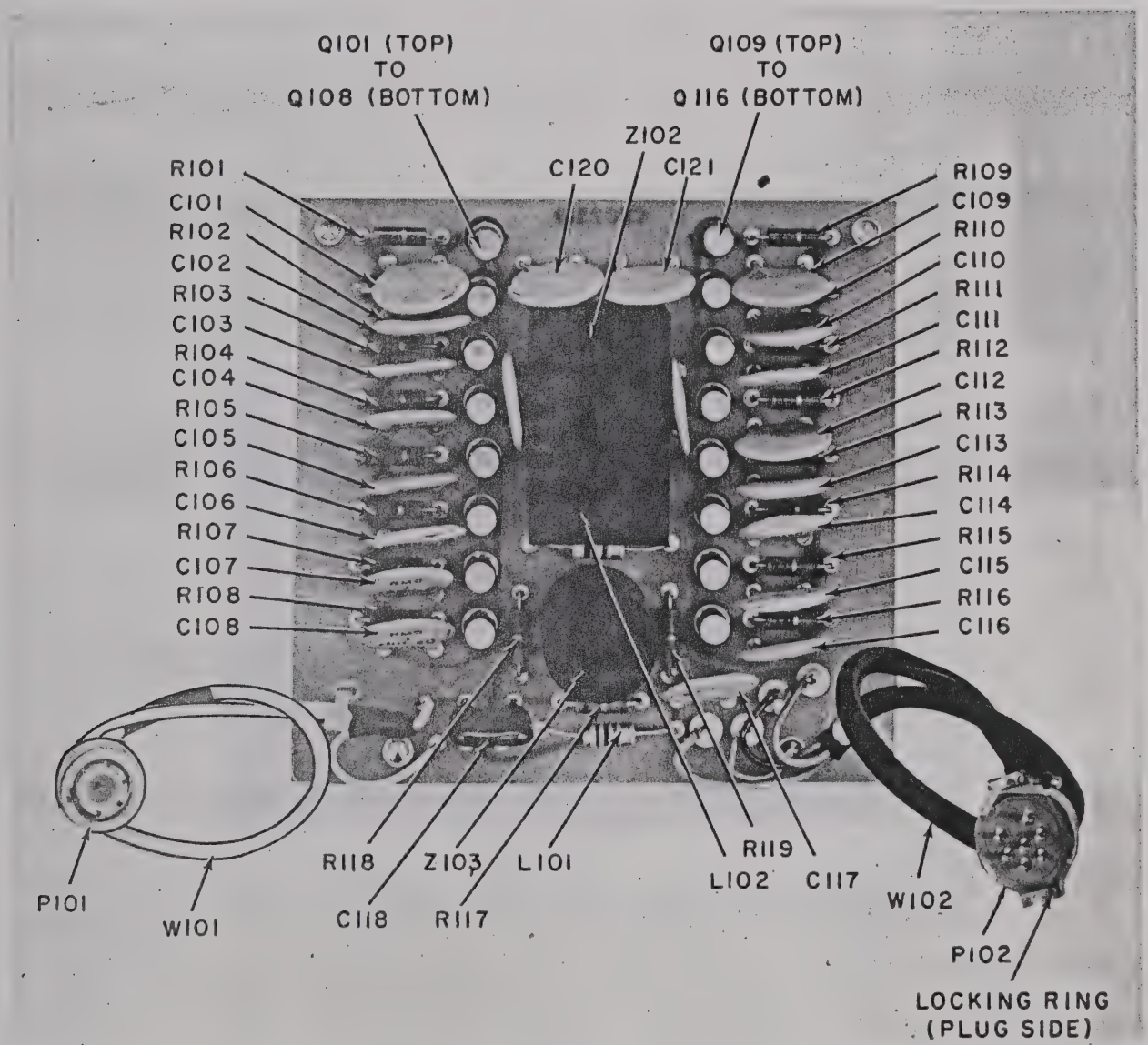


Figure 5-8. Preamplifier Assembly A101

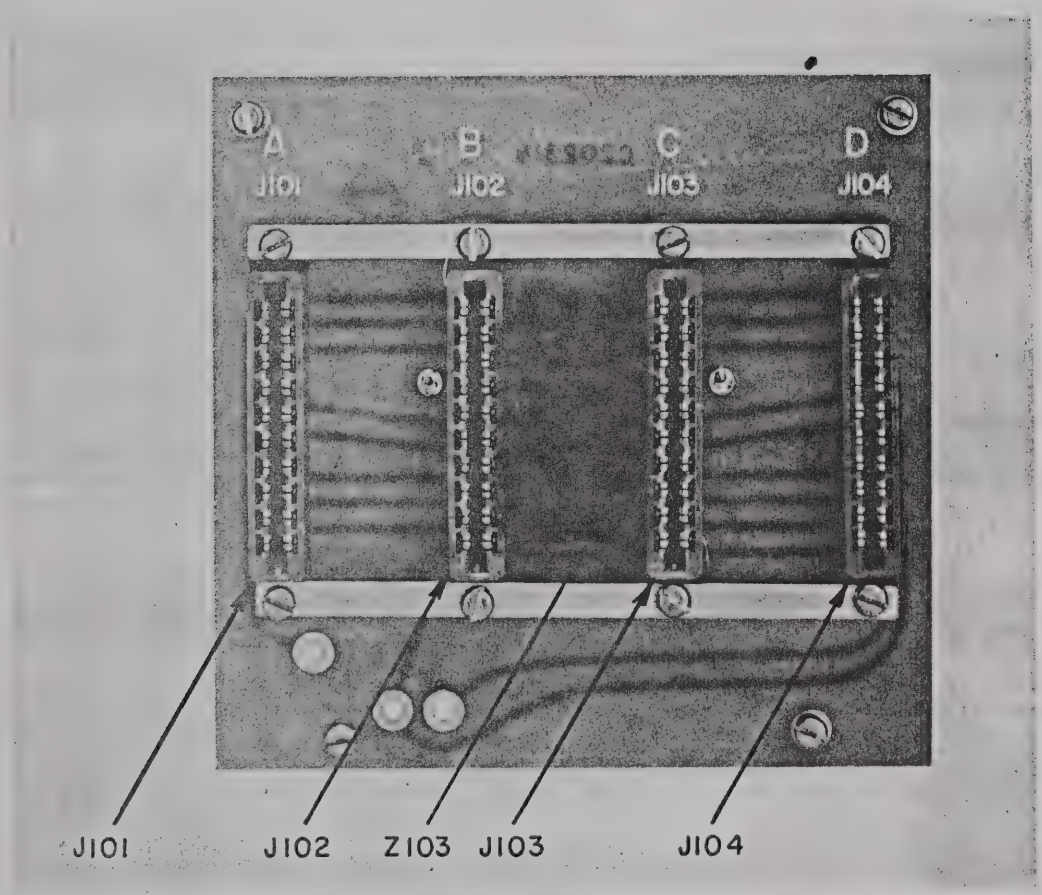


Figure 5-9. Connector Board Assembly

SECTION 6

PARTS LIST

6-1 INTRODUCTION

a. REFERENCE DESIGNATIONS. - The block numbering method of assigning reference designations has been used to identify assemblies and parts. Reference designations consist of the class letter (s) and an identifying number. They are used to identify parts on the equipment and illustrations.

b. ASSEMBLY DESIGNATIONS. - Assembly (A) numbers have been assigned to assemblies as follows:

A1 Isolator
A101 Preamplifier
A201 RF Filter
A301 Power Supply

Parts located on the front panel have been assigned designations in the 400 series. Parts not associated with a major assembly are listed in the 500 series.

6-2 MAINTENANCE PARTS LIST

Table 6-1 lists all assemblies and their maintenance parts. Assemblies are listed in numerical sequence. Maintenance parts for each assembly are listed in alphabetical numerical order.

6-3 LIST OF MANUFACTURERS

Table 6-2 lists the manufacturers of parts used in the equipment. The table includes the manufacturer's code used in table 6-1 to identify the manufacturer.

6-4 STOCK NUMBER IDENTIFICATION

Allowance Parts List (APL) issued by Electronics Supply Office (ESO) include Federal Stock Numbers and Source Maintenance and Recoverability Codes. Therefore, reference should be made to the APL prepared for the equipment for stock numbering information.

6-5 NOTES

The following notes provide information as referenced in table 6-1.

1. Four identical isolator assemblies are used in the CU-1099/FRR.
2. One adapter plate (MP501) is supplied with each two units.

TABLE 6-1 MAINTENANCE PARTS LIST

ANTENNA COUPLER CU-1099/FRR

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG NO
ISOLATOR ASSEMBLY			
A1	1	ISOLATOR ASSEMBLY: Printed circuit board; Mfr Trak, part 00089-4.	5-7
C1 to C12		CAPACITOR, FIXED: disc, 0.1μf +80% -20% 100v dc, Mfr Trak, part 102, 256.	
C13		CAPACITOR: MIL type CM05E39063	
C14		Same as C13	
J1		CONNECTOR, BNC: MIL type UG625B/U	
J2		Same as J1	
L1		REACTOR: 15μh ±10%, MIL type MS16225-21	
L2		Same as L1	
L3		COIL ASSEMBLY, PHASE ADJ: Mfr Trak, part 00089-5	
L4		COIL ASSEMBLY, PHASE ADJ: Mfr Trak, part 00089-49	
Q1 to Q8		TRANSISTOR, PNP: Mfr Trak, part 202, 512	
R1		RESISTOR: MIL type RC20GF121J	
R2		Same as R1	
R3 to R6		RESISTOR: MIL type RC20GF431J	
R7 to R14		RESISTOR: MIL type RC20GF621J	

TABLE 6-1 MAINTENANCE PARTS LIST (Cont)

ANTENNA COUPLER CU-1099/FRR

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG NO
R15		Same as R1	
R16		Same as R1	
R17		RESISTOR: MIL type RN60C44R2F	
to			
R24			
Z1		NETWORK, HYBRID: Mfr Trak, part 00089-6	
Z2		Same as Z1	
Z3		NETWORK, HYBRID: Mfr Trak, part 00089-7	

PREAMPLIFIER ASSEMBLY A101

A101		PREAMPLIFIER: printed circuit board; Mfr Trak, part 00089-24	5-8
C101		CAPACITOR, FIXED: 0.1μf +80% -20% 100v dc, Mfr Trak, part 102,256	
to		sub key same as C1	
C117			
C118		CAPACITOR: MIL type CM06D222G03	
C119		Not Used	
C120		Same as C101	
to			
C123			
L101		REACTOR, FIXED: 100μh ±5%, Mfr Delevan, part 1537-76	
L102		REACTOR, FIXED: 15μh ±5%, MIL type MS16225-21	
P101		CONNECTOR, PLUG, COAX BNC: Mfr Dage, part 9762-1	
P102		CONNECTOR, PLUG: includes hood, Mfr Winchester, part M-7-P95-LS-H19C-34	
Q101		TRANSISTOR, PNP: Mfr Trak, part 202, 513	
to			
Q116			
R101		RESISTOR: MIL type RC20GF102J	
to			
R117			
R118		RESISTOR: MIL type RC20GF221J	
R119		Same as R118	
W101		CABLE ASSEMBLY: one end terminated with P101, one end not terminated, Mfr Trak, part 00089-15	
W102		CABLE ASSEMBLY: one end terminated with P102, one end not terminated, Mfr Trak, part 00089-13	
Z101		NETWORK, HYBRID: Mfr Trak, part 00089-16	
Z102		NETWORK, HYBRID: Mfr Trak, part 00089-9	

CONNECTOR BOARD A102

A102		CONNECTOR BOARD: printed circuit board; Mfr Trak, part 00089-25	5-9
J101		CONNECTOR, RECEPTACLE: 10 contacts, Mfr Trak, part 202, 562	
to			
J104			
Z103		NETWORK, HYBRID: Mfr Trak, part 00089-10	

BANDPASS FILTER ASSEMBLY A201

A201		BANDPASS FILTER ASSEMBLY: Mfr Trak, part 00089-2	5-5
C201		CAPACITOR, VARIABLE: 1 to 16μμf 500v dc, Mfr JFD, part PC35H160	
C202		CAPACITOR: MIL type CM05D220J03	
C203		Same as C201	
C204		CAPACITOR: MIL type CM05D101J03	
C205		Same as C201	
C206		Same as C202	
C207		CAPACITOR: MIL type CM06D911G03	
C208		CAPACITOR: MIL type CM06D102G03	
C209		CAPACITOR, VARIABLE: 7-45μμf, MIL type CV11C450	

TABLE 6-1 MAINTENANCE PARTS LIST (Cont)

ANTENNA COUPLER CU-1099/FRR

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG NO
C210		Same as C208	
C211		Same as C209	
C212		Same as C207	
C213		CAPACITOR: MIL type CM06D392G03	
C214		CAPACITOR: MIL type CM05E39G3	
J201		CONNECTOR, RECEPTACLE, BNC: MIL type UG1098/U	
J202		Not used	
J203		Same as J101	
L201		REACTOR, FIXED: 0.33μh ±5%, Mfr Delevan, part ESO3279-1	
L202		REACTOR, FIXED: 0.47μh ±5%, Mfr Delevan, part BP511-13	
L203		Same as L202	
L204		Same as L201	
L205		REACTOR, VARIABLE: 10.8 to 17μh, Mfr North Hills, part 1300J	
L206		REACTOR, FIXED: 3.3μh ±5%, Mfr Delevan, part BP511-33	
L207		Same as L205	
L208		REACTOR, FIXED: 0.22μh ±10%, Mfr Delevan, part 1537-02	
R201		RESISTOR: MIL type RC20GF100J	

POWER SUPPLY ASSEMBLY A301

A301		POWER SUPPLY ASSEMBLY: Mfr Trak, part 00089-3	5-6
A302		CIRCUIT BOARD: printed circuit board, Mfr Trak, part 00089-22 See detail of parts following this list	
C302		CAPACITOR: MIL type CE51C501G	
J301		Not used	
J302		CONNECTOR, RECEPTACLE: 7 pins; Mfr Winchester, part ME-MS-7S-95-LRN, type 34	
Q302		TRANSISTOR: MIL type JAN-2N1039-1	
T301		TRANSFORMER, POWER: Mfr Trak, part 202, 394	
XC302		SOCKET, OCTAL: MIL type TS101P02	

POWER SUPPLY CIRCUIT BOARD A302

C301		CAPACITOR: MIL type CS13AE330K	
CR301		DIODE: MIL type JAN 1N754A	
CR302		Same as CR301	
CR303 to CR307		DIODE: MIL type JAN 1N538	
CR308		DIODE: JAN 1N755A	
Q301		TRANSISTOR: MIL type JAN 2N526	
R301		RESISTOR: MIL type RC20GF102J, sub key same as R101	
R302		Same as R301	
R303		RESISTOR: MIL type RC20GF511J, sub key same as R118	
R304		RESISTOR: MIL type RW59G0R47	
R305		RESISTOR: MIL type RC20GF121J	
R306		RESISTOR: MIL type RC20GF361J	
R307		Same as R306	
R308		RESISTOR, VARIABLE: MIL type RT22CEP2000K	
R309		RESISTOR: MIL type RC20GF431J	

FRONT PANEL ASSEMBLY DS401

DS401		Part of XF401	3-1
DS402		Part of XF402	
DS403		LAMP, INDICATOR: MIL type NE-2	
F401 to F404		FUSE, CARTRIDGE: MIL type FO3GR187B	

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PREAMPLIFIER A101

ALL BASES 4.8V
ALL EMITTERS -4.6V
-19V
ALL COLLECTORS

R101 1000, C101 0.1, Q101
R102 1000, C102 0.1, Q102
R103 1000, C103 0.1, Q103
R104 1000, C104 0.1, Q104
R105 1000, C105 0.1, Q105
R106 1000, C106 0.1, Q106
R107 1000, C107 0.1, Q107
R108 1000, C108 0.1, Q108
R118 220, C122 0.1, L102 15UH, Z102 15UH
R119 220, C123 0.1, C117 0.1, C116 0.1, Q116
C115 0.1, R116 1000, Q115
C114 0.1, R115 1000, Q114
C113 0.1, R114 1000, Q113
C112 0.1, R113 1000, Q112
C111 0.1, R112 1000, Q111
C110 0.1, R111 1000, Q110
C109 0.1, R110 1000, Q109
R109 1000
C120 0.1
C121 0.1
-5V
-19V

W101
P101
C118 2200
R117 1000
L101 100 UH
Z101

BANDPASS FILTER A201

W502
P503
P403
INPUT FROM ANTENNA
J203
C213 3900
C210 1000
C208 1000
L203 0.47UH
L202 0.47UH
C214 39
J201
L208 0.22UH
L207 10.8-17 UH
C212 910
C211 7-45
L206 3.3UH
C207 910
C209 7-45
L205 10.8-17 UH
C206 22
L204 0.33UH
C204 100
C205 1-16
R201 10
C203 1-16
C202 22
L201 0.33UH
C201 1-16
HIGH PASS
LOW PASS

CONNECTOR BOARD A102

J101
J102
J103
J104
Z103
-19V
-7.5V
GND

ISOLATOR AI
ALL BASES -7.4V
ALL COLL
Z3

ISOLATOR AI

ISOLATOR AI

ISOLATOR AI

NOTE: SIGNAL TO EACH ISOLATOR IS 180° OUT OF PHASE WITH RETURN

POWER INPUT
105V-115V-125V
(CHECK T301)
48-62 CPS

P502
W501
P501
A B C J301
FL501
1
2

S401

F401 .187 AMP
DS401
DS403
DS402
F402 .187 AMP

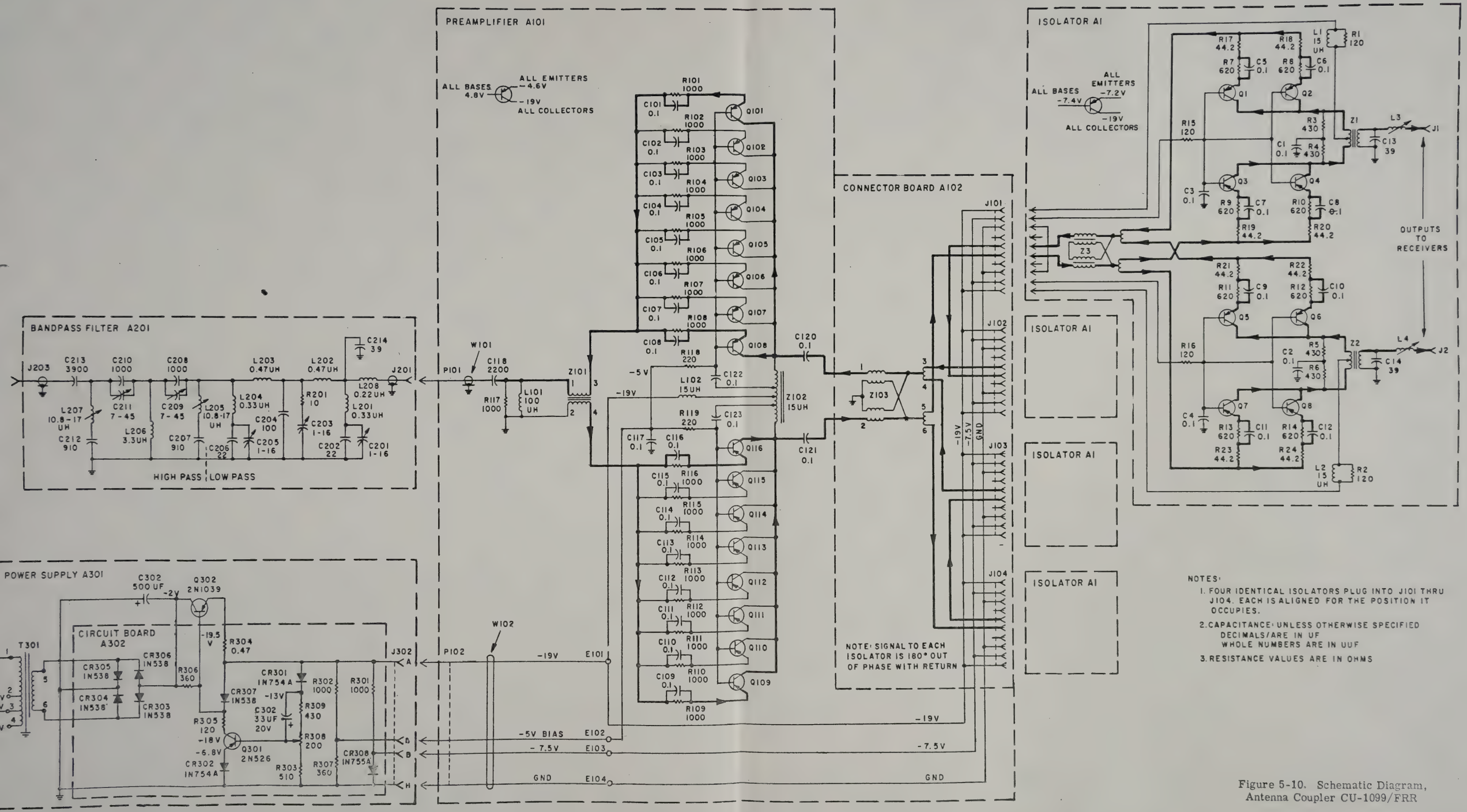
T301
105V
115V
125V

POWER SUPPLY A301

C302 500 UF -2V
Q302 2N1039
CIRCUIT BOARD A302
-19.5 V
R304 0.47
CR306 IN538
CR305 IN538
CR304 IN538
CR303 IN538
R306 360
CR301 IN754A
R302 1000
R301 1000
CR307 IN538
-13V
C302 33UF 20V
R309 430
R305 120
-18V
-6.8V
Q301 2N526
R308 200
CR302 IN754A
R303 510
R307 360
CR308 IN755A
J302
A
B
H

W102
P102
-19V
E101
-5V BIAS
E102
-7.5V
E103
GND
E104

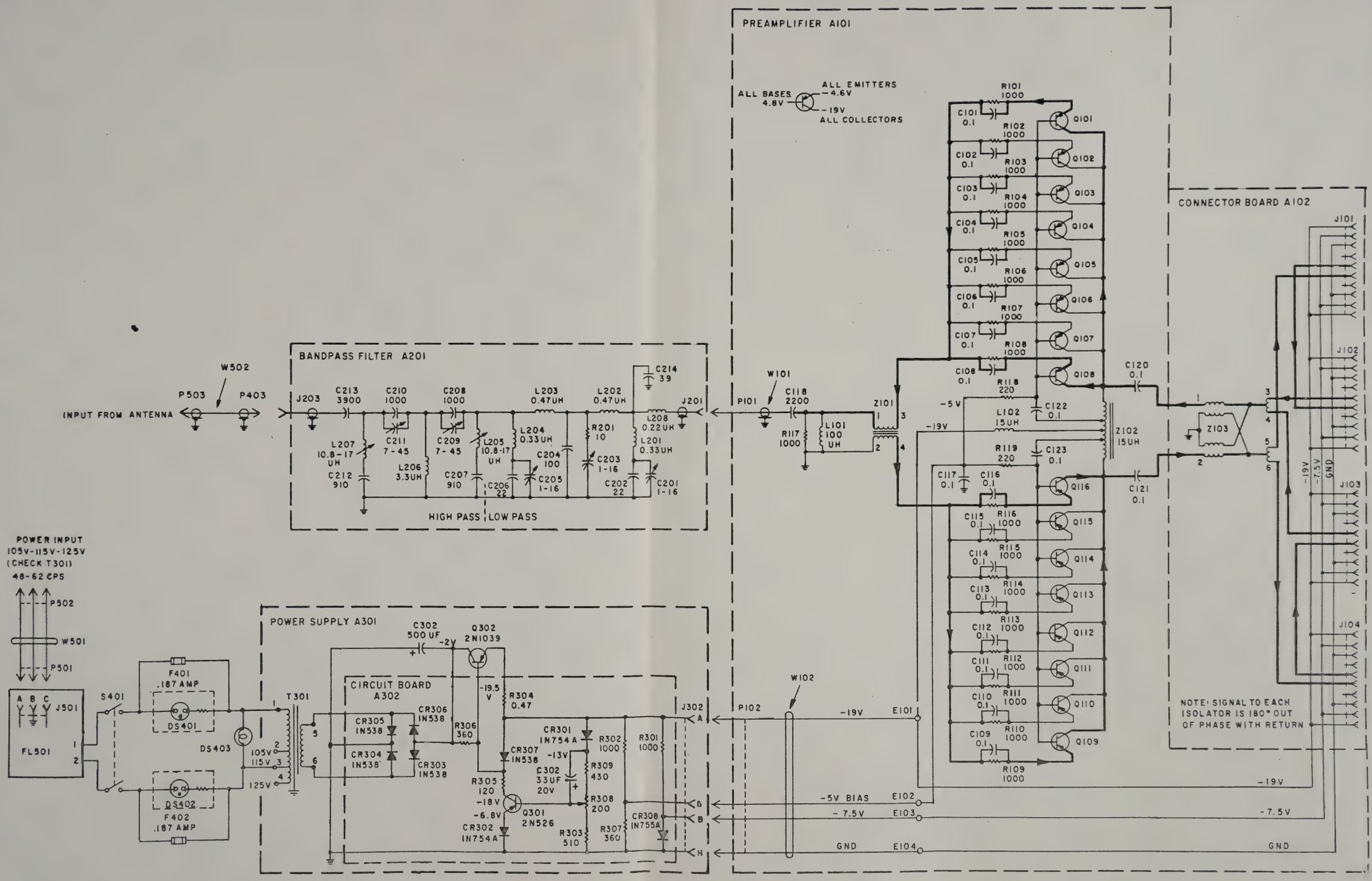
-19V
-7.5V
GND



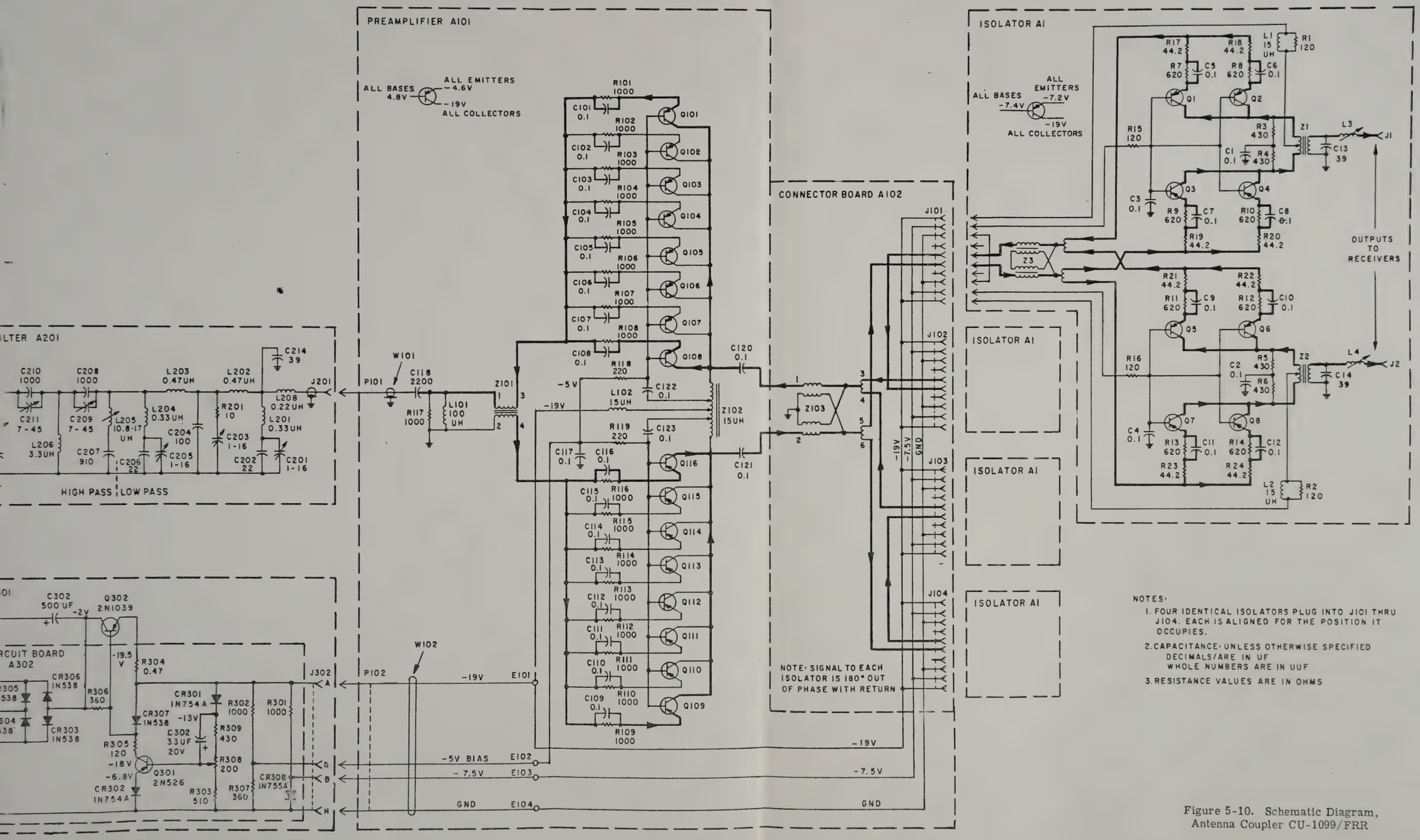
NOTES:

1. FOUR IDENTICAL ISOLATORS PLUG INTO J101 THRU J104. EACH IS ALIGNED FOR THE POSITION IT OCCUPIES.
2. CAPACITANCE: UNLESS OTHERWISE SPECIFIED DECIMALS ARE IN UF WHOLE NUMBERS ARE IN UUF
3. RESISTANCE VALUES ARE IN OHMS

Figure 5-10. Schematic Diagram, Antenna Coupler CU-1099/FRR


PREAMPLIFIER A101
ALL BASES 4.8V
ALL EMITTERS -4.6V
-19V ALL COLLECTORS
BANDPASS FILTER A201
INPUT FROM ANTENNA
W502
P503
P403
J203
C213 3900
C210 1000
C208 1000
L203 0.47UH
L202 0.47UH
C214 39
J201
L207 10.8-17 UH
C212 910
C211 7-45
L206 3.3UH
C209 7-45
C207 910
L205 10.8-17 UH
C206 22
L204 0.33UH
C204 100
C205 1-16
R201 10
C203 1-16
C202 22
L208 0.22UH
L201 0.33UH
C201 1-16
HIGH PASS
LOW PASS
W101
P101
C118 2200
R117 1000
L101 100 UH
Z101
-5V
-19V
L102 15UH
C122 0.1
R119 220
C123 0.1
Z102 15UH
C120 0.1
C121 0.1
C117 0.1
C116 0.1
Q116
R116 1000
Q115
R115 1000
Q114
R114 1000
Q113
R113 1000
Q112
R112 1000
Q111
R111 1000
Q110
R110 1000
Q109
R109 1000
C115 0.1
C114 0.1
C113 0.1
C112 0.1
C111 0.1
C110 0.1
C109 0.1
R101 1000
Q101
R102 1000
Q102
R103 1000
Q103
R104 1000
Q104
R105 1000
Q105
R106 1000
Q106
R107 1000
Q107
R108 1000
Q108
C101 0.1
C102 0.1
C103 0.1
C104 0.1
C105 0.1
C106 0.1
C107 0.1
C108 0.1
R118 220
CONNECTOR BOARD A102
J101
J102
J103
J104
Z103
Z3
ISOLATOR A1
ISOLATOR A1
ISOLATOR A1
ISOLATOR A1
-19V
-7.5V
GND
NOTE: SIGNAL TO EACH ISOLATOR IS 180° OUT OF PHASE WITH RETURN
POWER INPUT
105V-115V-125V
(CHECK T301)
48-62 CPS
P502
W501
P501
A B C
J501
FL501
S401
F401 .187 AMP
DS401
DS403
DS402
F402 .187 AMP
T301
105V
115V
125V
POWER SUPPLY A301
CIRCUIT BOARD A302
C302 500 UF -2V
Q302 2N1039
-19.5 V
R304 0.47
CR305 IN538
CR306 IN538
CR304 IN538
CR303 IN538
R306 360
CR307 IN538
-13V
C302 33UF 20V
R305 120
-18V
-6.8V
Q301 2N526
CR302 IN754A
CR301 IN754A
R302 1000
R309 430
R308 200
R303 510
R307 360
R301 1000
CR308 IN755A
J302
A
B
H
W102
P102
E101
E102
E103
E104
-5V BIAS
-7.5V
GND

ORIGINAL



NOTES:

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2. CAPACITANCE: UNLESS OTHERWISE SPECIFIED DECIMALS/ARE IN UF WHOLE NUMBERS ARE IN UUF
3. RESISTANCE VALUES ARE IN OHMS

Figure 5-10. Schematic Diagram, Antenna Coupler CU-1099/FRR

PREAMPLIFIER A101

ALL BASES 4.8V
ALL EMITTERS -4.6V
-19V
ALL COLLECTORS

R101 1000 — C101 0.1 — Q101
R102 1000 — C102 0.1 — Q102
R103 1000 — C103 0.1 — Q103
R104 1000 — C104 0.1 — Q104
R105 1000 — C105 0.1 — Q105
R106 1000 — C106 0.1 — Q106
R107 1000 — C107 0.1 — Q107
R108 1000 — C108 0.1 — Q108
R118 220 — C122 0.1 — L102 15UH — Z102 15UH
R119 220 — C123 0.1 — C117 0.1 — C116 0.1 — Q116
R116 1000 — C115 0.1 — Q115
R115 1000 — C114 0.1 — Q114
R114 1000 — C113 0.1 — Q113
R113 1000 — C112 0.1 — Q112
R112 1000 — C111 0.1 — Q111
R111 1000 — C110 0.1 — Q110
R110 1000 — C109 0.1 — Q109
R109 1000

-5V
-19V
C120 0.1
C121 0.1
W101
P101
C118 2200
R117 1000
L101 100 UH
Z101

BANDPASS FILTER A201

J203 — C213 3900 — C210 1000 — C208 1000 — L203 0.47UH — L202 0.47UH — C214 39 — J201
L208 0.22UH
L207 10.8-17 UH — C211 7-45 — C209 7-45 — L205 10.8-17 UH — L204 0.33UH — R201 10 — L201 0.33UH
C212 910 — L206 3.3UH — C207 910 — C206 22 — C205 1-16 — C204 100 — C203 1-16 — C202 22 — C201 1-16
HIGH PASS | LOW PASS

CONNECTOR BOARD A102

J101 — J102 — J103 — J104
Z103
-19V
-7.5V
GND
NOTE: SIGNAL TO EACH ISOLATOR IS 180° OUT OF PHASE WITH RETURN

ISOLATOR A1

ALL BASES -7.4V
ALL EMITTERS -7.2V
-19V
ALL COLLECTORS

R17 44.2 — R18 44.2 — L1 15 UH — R1 120
R7 620 — C5 0.1 — R8 620 — C6 0.1
Q1 — Q2
R15 120 — R3 430 — Z1 — L3 — J1
C1 0.1 — R4 430 — C13 39
Q3 — Q4
C3 0.1 — R9 620 — C7 0.1 — R10 620 — C8 0.1
R19 44.2 — R20 44.2
Z3
OUTPUTS TO RECEIVERS
R21 44.2 — R22 44.2
R11 620 — C9 0.1 — R12 620 — C10 0.1
Q5 — Q6
R16 120 — R5 430 — Z2 — L4 — J2
C2 0.1 — R6 430 — C14 39
Q7 — Q8
C4 0.1 — R13 620 — C11 0.1 — R14 620 — C12 0.1
R23 44.2 — R24 44.2
L2 15 UH — R2 120

ISOLATOR A1
ISOLATOR A1
ISOLATOR A1

POWER SUPPLY A301

C302 500 UF — -2V — Q302 2N1039
-19.5 V — R304 0.47
T301
CIRCUIT BOARD A302
CR305 IN538 — CR306 IN538 — R306 360 — CR304 IN538 — CR303 IN538
CR301 IN754A — R302 1000 — R301 1000
CR307 IN538 — -13V — C302 33UF 20V — R309 430
R305 120 — -18V — Q301 2N526 — R308 200
-6.8V — CR302 IN754A — R303 510 — R307 360 — CR308 IN755A
J302 A B H

W102
P102
-19V — E101
-5V BIAS — E102
-7.5V — E103
GND — E104

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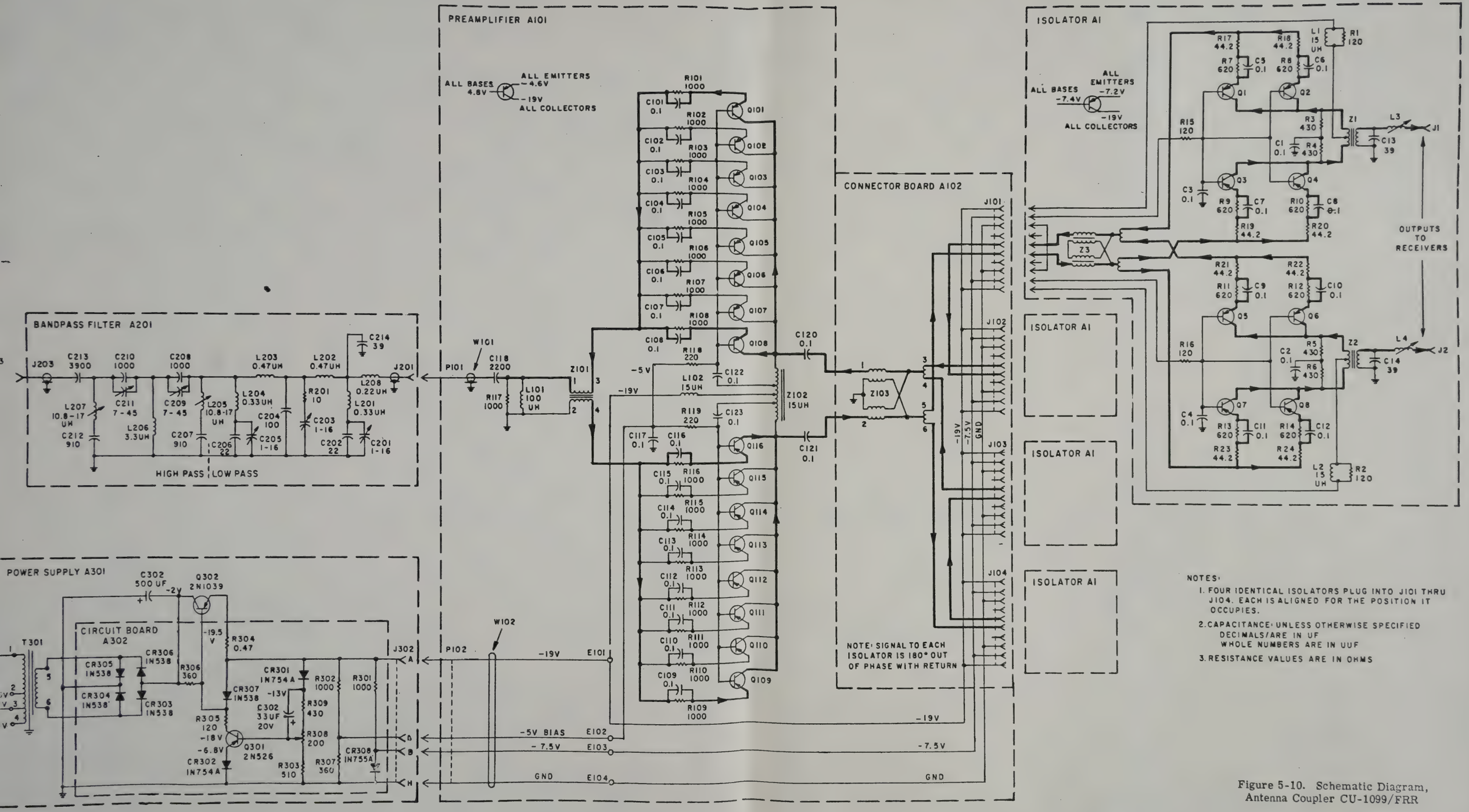

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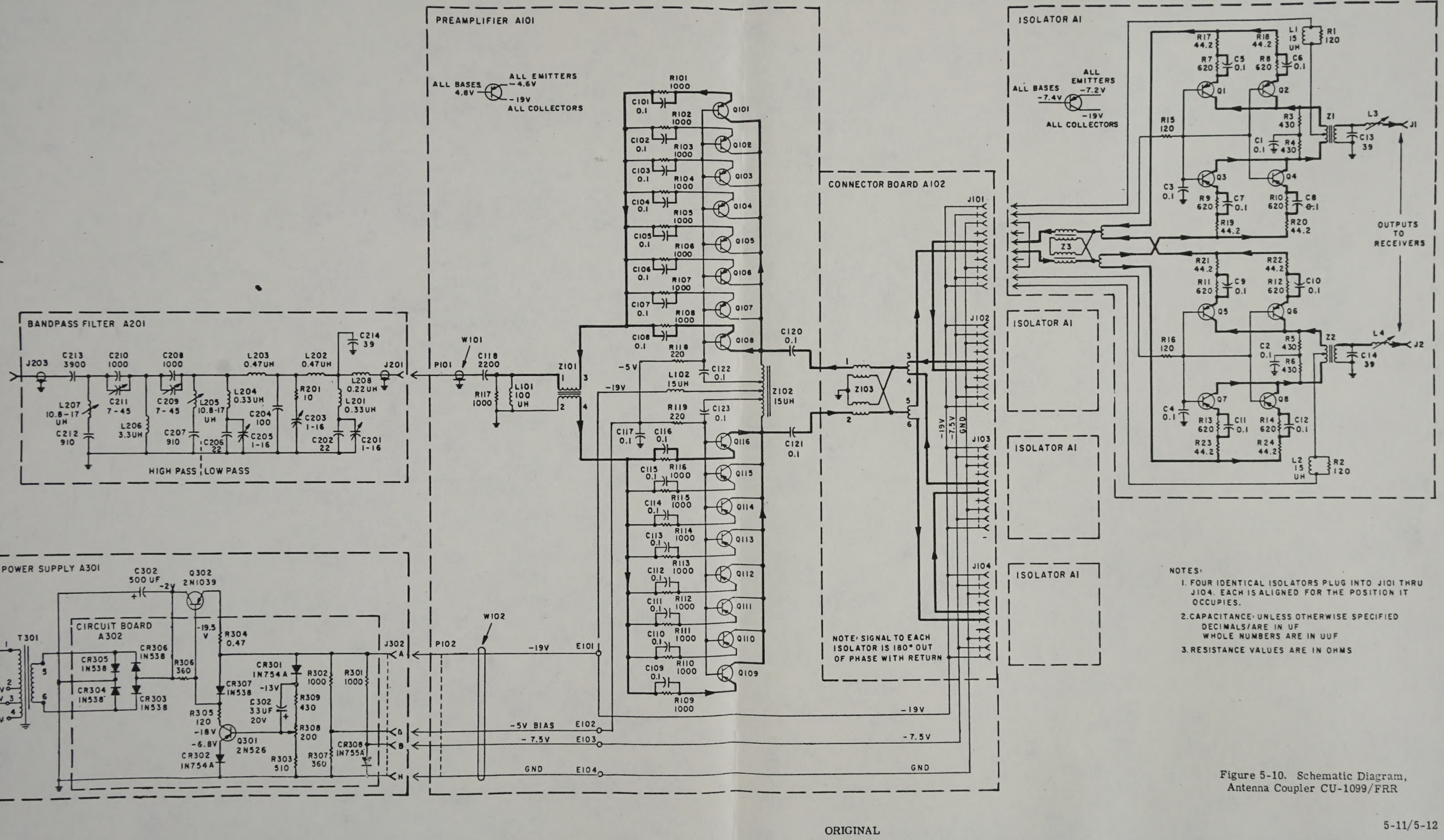
Figure 5-10. Schematic Diagram, Antenna Coupler CU-1099/FRR



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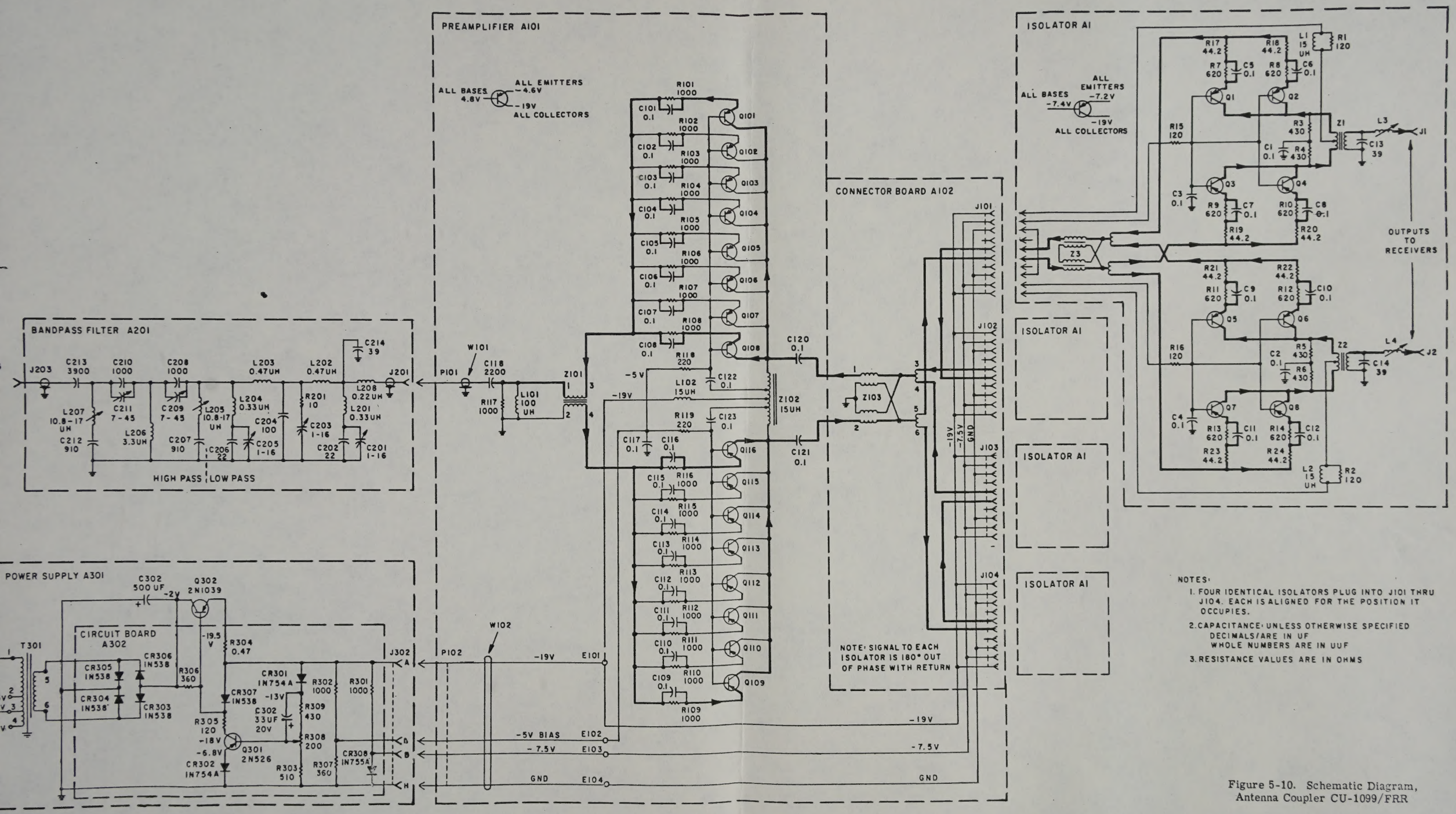

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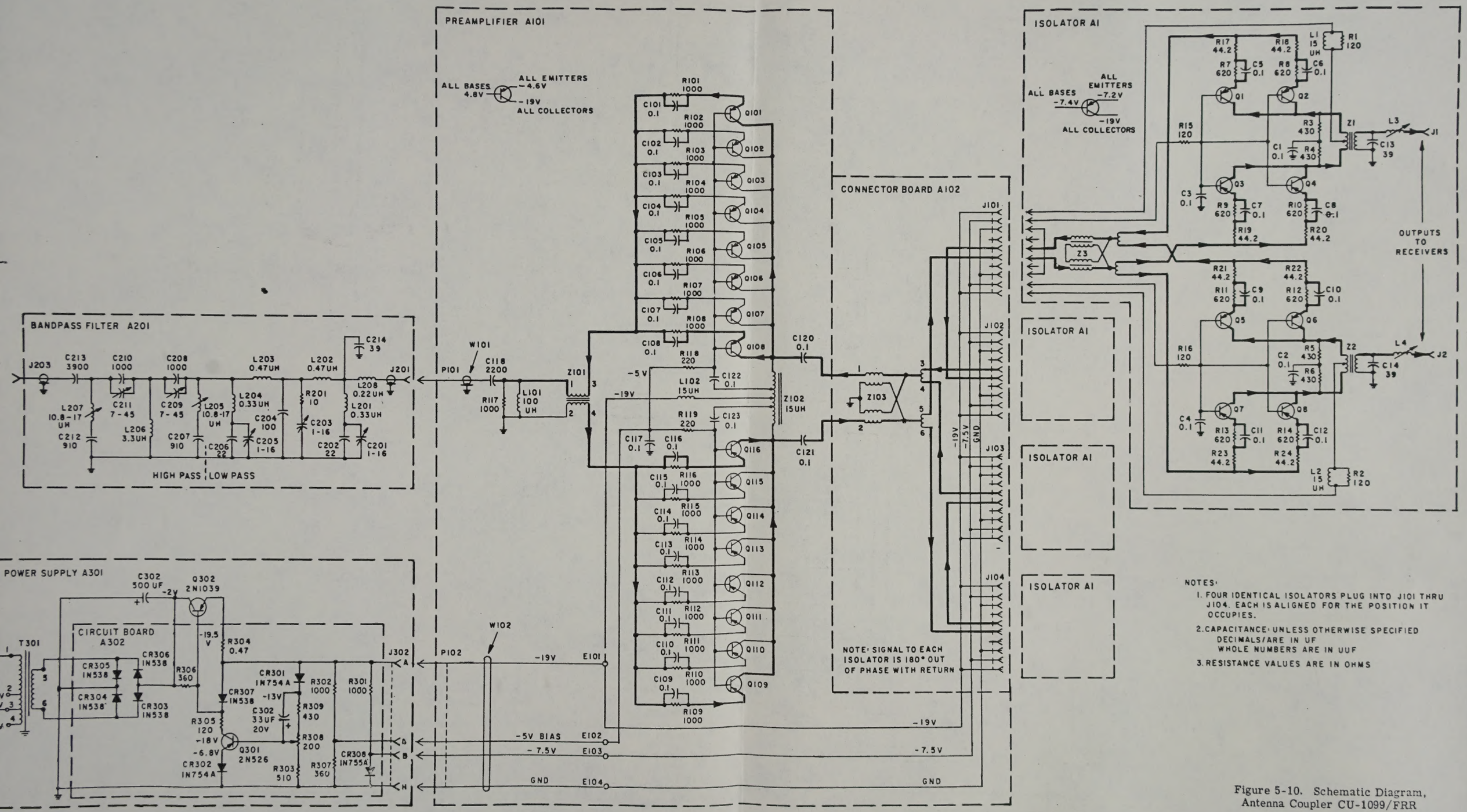

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